MultiCONT

USER'S AND PROGRAMMING MANUAL

v.01._ _

Manufacturer:
NIVELCO Process Control Co.
1043 Budapest, Dugonics u. 11.
Phone: 889-0100 ♦ Fax: 889-0200
e-mail: marketing@nivelco.com ♦ www.nivelco.com

MultiCONT
UNIVERSAL PROCESS CONTROLLER
1:DB500
.0295
2006.02.02
15:15
R
IrDA
T
ESC
OK
nivelco®

TABLE OF CONTENTS

1. INTRODUCTION 5
1.1. THE HART SYSTEM 6
1.1.1. The Communication 6
1.1.2. The structure of the system 6
1.1.2.1 Point-to-point connection 7
1.1.2.2 Multipoint connection (Multidrop). Multiple slaves connected in parallel. 8
1.1.3. Properties of HART-capable devices 9
1.1.4. HART Command set 9
1.1.4.1 Universal commands 10
1.1.4.2 General commands 11
1.1.4.3 Device –specific commands 11
2. TECHNICAL DATA 12
2.1. ACCESSORIES 13
3. ORDER CODE 13
3.1. DIMENSIONS 14
3.2. CONDITIONS OF USE OF THE EX UNITS 15
4. ELECTRICAL CONNECTION 16
4.1. ARRANGEMENT OF THE CABLE TERMINALS 16
4.2. WIRING 17
4.2.1. Transmitter connection (wiring) 17
4.2.1.1 Wiring of 2-wire units (transmitters) 17
4.2.1.2 Wiring of 4-wire units (transmitters with separate power supply) 18
4.2.1.3 Wiring of Combined Systems (containing both 2- and 4-wire transmitters) 19
4.2.2. Wiring of Universal Interface Modules (UIM-s; order code: PJK-100) 20
5. PROGRAMMING OF MultiCONT 21
5.1. STEPS OF PROGRAMMING 22
5.1.1. Scrolling and selecting menu items 23
5.1.2. Activation (of devices, relays and current outputs) selection (of language and operation mode) 24
5.1.3. Assignment of outputs (relay and current) to the device 25
5.1.4. Entering parameter values 26
5.1.5. Editing character variables 27
5.2. Steps of Commissioning a MultiCONT Network 27
5.2.1. Preparation of the Transmitters and the Universal Interface Modules. 28
5.2.1.1 Preparation of the Transmitters 28
5.2.1.2 Preparing of the Universal Interface Modules 28
5.2.2. Wiring 28
5.2.3. Commissioning the MultiCONT 29
5.3. MAIN MENU 30
5.4. MULTICONT CONFIGURATION 31
5.4.1. DEV detect: 32
5.4.2. EXT detect: 37
5.4.3. Display 37
5.4.3.1 Source 38
5.4.3.2 Rounding 39
5.4.3.3 Stepping 39
5.4.4. List display 40
5.4.5. User Display: 41
5.4.5.1 Editing the user display 41
5.4.5.2 The various user displays 42
5.4.6. HART 43
5.4.6.1 Short TAG 43
5.4.6.2 Short Address 44
5.4.6.3 Message 44
5.4.6.4 Description 44
5.4.6.5 Date 45
5.4.6.6 Command Set 45
5.4.6.7 Retrial count 48
5.4.6.8 Cycle count 48
5.4.6.9 Cycle time: 49
5.4.6.10 Test 51
5.4.6.11 Statistics 52
5.4.7. USER RS485 52
5.4.8. Secret code 53
5.4.9. Language 54
5.4.10. Background lighting 54
5.4.11. Report: 55
5.4.12. Prog CS 55

5.5. PROGRAMMING DEVICES 56
5.6. REMOTE PROGRAMMING 57
5.6.1. Editing the linearisation table 59
5.7. RELAY CONFIGURATION 60
5.7.1. Relay Selection 60
5.7.2. Properties of the selected relay 61
5.7.3. Relay programming 62
5.7.3.1 Source selection 62
5.7.3.2 Function 62
5.7.3.3 Configuring parameters 65
5.7.3.4 Inversion 66
5.7.3.5 Deleting TOT 66
5.7.3.6 Refreshing TOT 67
5.7.3.7 Testing 67
5.8. OPERATION AND PARAMETERS OF CURRENT OUTPUTS 69
5.8.1. Selection of Current outputs 69
5.8.2. Properties of the selected Current Output 70
5.8.3. Current Output programming 70
5.8.3.1 Source selection 70
5.8.3.2 Function 71
5.8.3.3 Parameter configuration 72
5.8.3.4 Testing 72
5.9. THE BOOT PROCESS 73
5.10. MEASUREMENT MODES 75
6. ERROR CODES 76
7. HARDWARE PROTECTION OF SETTINGS 78
8. FUSE REPLACEMENT 79
9. SERVICING 80
9.1. BOX MESSAGES: 80
9.2. OTHER MESSAGES: 81
9.3. TROUBLESHOOTING 82
9.3.1. It is impossible to enter the „Main menu"/"Relays" or „Main menu"/„Current outputs" menu: 82
9.3.2. It is impossible to enter the „Main menu"/"Devices" menu: 82
9.3.3. A „Please wait" message appears upon selecting „DEV detect" 82
The result of „DEV detect" is the „No device" message 82
9.3.5. The unit does not start up when switched on 82
9.3.6. The „Response" error entry is too frequent 82
9.4. ADDITIONAL INFORMATION 83
9.4.1. Problems that may occur during remote programming: 83
9.4.2. MultiCONT transmits the parameters without examining them, and the testing is done by the device. 83
9.4.3. Use of Second HART Master (Hand-Held or HART modem + Eview program) 83
9.4.4. Upon exiting remote programming, the unit tests to see if the transmitter really exited the remote programming mode 83
9.4.5. When a transmitter does not respond, then „Response" error is entered into the table, but upon termination of the error (the device responds), this entry is automatically cleared from the table (and does not need to be acknowledged) 83
9.4.6. Upon exiting the menu, MultiCONT immediately saves the modifications 83
9.4.7. The error list is cleared when the device is put off 83

Appendix 1. ManufacturerID codes of HART-capable devices 84
Appendix 2 The menu system of the MultiCONT PRW-100 85
Appendix 3 Relay programming 87
Appendix 4 Current output programming 88
Appendix 5 Measurement mode 89

Thank you for choosing a NIVELCO instrument.
We are sure that you will be satisfied throughout its use!

1. INTRODUCTION

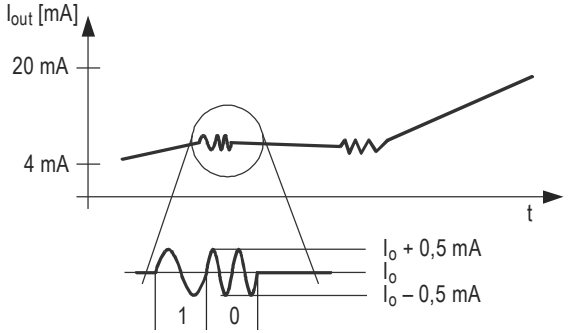
The MULTICONT unit is a universal interface between Nivelco's HART-capable intelligent level transmitters and the other elements of the process control system like the PC-s , PLC-s, displays and the actuators. Besides its role as an interface, the MultiCONT ensures the powering of the 2-wire transmitters while being capable of complex control tasks. The MultiCONT units support communication with a maximum of 15 ordinary or 2 Ex certified Nivelco's HART-capable 2- and / or 4-wire transmitters. Should a system contain more transmitters than one MultiCONT can handle, further MultiCONT units can be wired in series via an RS485 line. Remote programming of the transmitters and downloading of the parameters and measured data is possible using the MultiCONT. The various outputs such as 4 … 20 mA, relays and digital outputs can be controlled using measured values and new values calculated from the measured values.

Large DOT matrix LCD panel facilitate a wide variety of display functions including tank content visualisation. The type and number of outputs of the basic unit can be expanded with external (relay and/or current output) PJK-100 type Universal Interface Modules. The total number of relays included in the Multicont and in the modules must not be more than 64, while that of the analog outputs (4…20 mA outputs) can be maximum 16. A further restriction is that there can be a maximum of 32 Universal Interface Modules.

Explosion proof certified versions of the MultiCONT should be installed outside the hazardous area.

1.1. THE HART SYSTEM

The HART (Highway Addressable Remote Transducer – bus addressable field devices) is a digital communication protocol developed by ROSEMOUNT for industrial measurement applications. A digital signal of small amplitude is placed on the widely used standard 4…20mA output current, and due to its symmetric sinusoidal nature and its small amplitude, it does not affect the accuracy of the output current. Since no extra cable is needed for signal transfer, the already existing cable can be used to realize the transfer. The identification, programming and querying of the transmitters can be done using this communication.



This diagram shows the output signal of a 4…20mA transmitter (device) and the superimposed HART signal, which is essentially a ±0.5 mA modulation of the output current..

The enlarged picture shows that we are dealing with frequency modulation, and logical „1" is assigned to 1200 Hz, while „0" is assigned to 2200 Hz. This is called FSK modulation. The communication is realized with systematic series of impulses above described.

1.1.1. The Communication

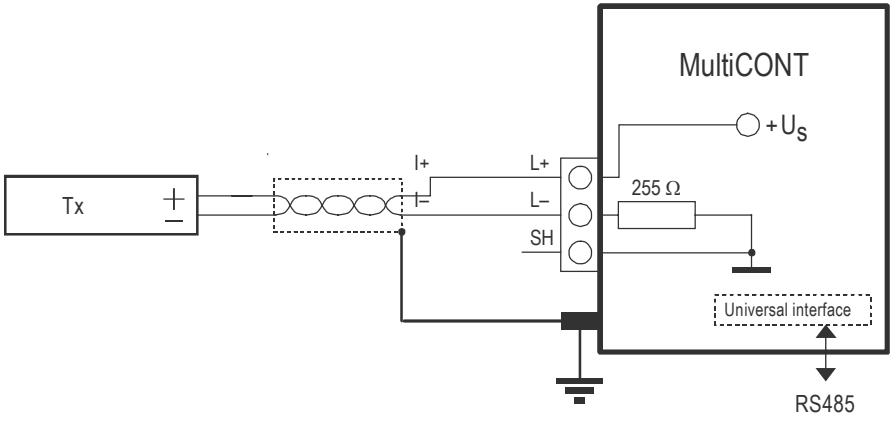
The HART communication is basically a master-slave type, which means that the transmitter – slave – only sends a response when the master (of which there can only be one in the system) sends a query. The master can be a Hand-held Communicator, a PC with a HART modem or a universal interface, in this case, a MultiCONT (naturally, only one can be active). The communication uses standard commands (see chapter 1.1.3)

1.1.2. The structure of the system

The system must contain a 230..1000 Ω resistor to guarantee that the HART signal of small amplitude will not load the power supply of unknown output impedance.

1.1.2.1 Point-to-point connection

When a master (communicator or HART modem with PC or MultiCONT) and a slave are alone in a system, we talk of a point-to-point connection

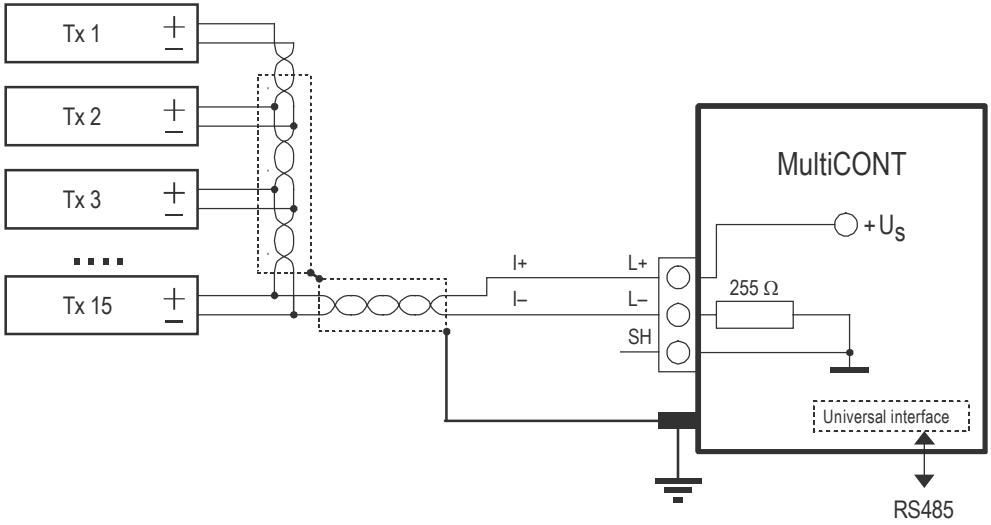


In this case the flowing current is the output current of the transmitters, so if permitted by the loop voltage, even a local indicator can be included into the loop. Essentially, the minimal voltage specified in the manual must remain on the terminals of the transmitters.

Since the speed of transfer is 1200bit/sec, communication is slow, because the master queries and the slave responds. This can be speeded up if the querying is left out, and the slave responds continuously every given period of time until the master stops the transfer in the break between 2 data transmissions. This is called “burst mode”.

1.1.2.2 Multipoint connection (Multidrop). Multiple slaves connected in parallel.

HART's addressing system can handle 15 devices whereby they are wired in parallel. In this case, the current is the sum of the currents of all the devices in the loop, which is not of informative value. So in this case, the output current of the transmitters should be set to multidrop mode, which means a constant current of 4mA. This automatically happens when the polling address is set between 1..15. (if the polling address is 0, then we should have only one transmitter with 4…20mA output, if the polling address is 1…15, then we will have a constant 4mA). There is a deviation possibility for transmitters whose output current can be programmed to an arbitrary value exceptions, however, in this case, the minimal voltage drop on the terminal of the transmitters must be the minimum specified voltage, otherwise the transmitter(s) will not be able to work (measure or respond)



In a Multidrop system, the „burst mode" does not work

1.1.3. Properties of HART-capable devices

These are programmed into the unit during manufacture, some can be configured using a HART MASTER, other cannot (they can be reconfigured only by the manufacturer)

Short TAG	8 character device ID. Can be reconfigured.
Short address	Used to differentiate the 0…15 devices. There can't be 2 identical „short addresses" in one system. Can be reconfigured
Message	A max 32-character arbitrary comment that can be assigned to the device and is generally operation-related. Can be reconfigured
Descriptor	A max 16-character arbitrary comment that can be assigned to the device and is generally material-related. Can be reconfigured
Date	Date. Can be assigned to the device. Can be reconfigured
Factory ID	Factory ID. For Nivelco devices this: 151, cannot be reconfigured
Device type ID	Device type ID, cannot be reconfigured
Device ID	The manufacturer's electronic production number, cannot be reconfigured The Factory ID, the Device Type ID and the Device ID together form the "Long Address".
SW version (Software version):	Software version of the device (see device manual)
HW version (Hardware version):	Hardware version of the device (see device manual)

Apart from this, they provide the specification of the HART version according to which the device's commands work

1.1.4. HART Command set

We have seen how to build up a HART system. Using the HART commands, we can decide what the devices should do. Naturally, an ultrasonic transmitter needs commands different from those of a temperature transmitter or maybe a valve, so quite a large number of commands are needed. Every command has a one-byte identifier. The 31st command is enables expansion, and in this case the next 2 bytes form the code of a command (0…65535). HART commands can be divided in to 3 classes:

- universal commands 0..30
- general commands 32..121
- device-specific commands 128..253

In all cases, the commands contain an address (this can be short, long address, TAG), which determines the corresponding device.
Two devices with the same addresses cannot be connected together.

1.1.4.1 Universal commands

These are commands understood by all devices, and to which all devices give the same reply.

0. Read unique identifier
   the addressed device provides the following in it's reply:
   – Manufacturer's code (provided by the HART foundation, see appendix)
   – Product code (provided by manufacturer, see chapter 5.2.1.1)
   – Universal command table code (HART 5)
   – Device ID
   – Software version
   – Hardware version
   – Device status

1. Read primary variable
   This reads the digital value (Primary Value) that the transmitter sends to the 4…20 mA output.
   The dimension (unit) also belongs to the numeric value.

2. Read output current in mA and in %

3. Read output current and four dynamic variables
   The primary, secondary, tertiary and quaternary variables are transmitted.
   The secondary, tertiary and quaternary variables are specified in the manual of the given device.

6. Modify (short) polling address (Write polling address)
   If there is more than one device in the loop (multidrop), each device must have a different address.
   In this case, the address should be configured before connecting the device to avoid errors caused by devices with the same addresses replying at the same time.

11. Read unique device identifier associated with tag
    Devices are queried based on their short TAG and not based on their addresses.
    As a result, there must not be more than one device with exactly the same short TAG.

12. Read device message (Read message)
    This reads the 32 character message stored int he non-volatile memory of the device (e.g. T18 35% HCL TANK)
13. Reads 8 character short TAG, 16 character descriptor and date (Read tag, descriptor, date)
14. Read PV sensor information
15. Read output information
16. Read final assembly (serial) number
17. Writes 32 character message (Write message)
18. Write 8 character short TAG, 16 character descriptor and date (Write tag, descriptor, date)
19. Write final assembly number

1.1.4.2 General commands

These commands do not need to be understood by all devices. If not understood, nothing happpens, however, if understood, then it must be interpreted according to the standard. Many such commands exist, with the most important ones being:

- 34: damping (writing settling time)
- 35: measurement range (writing of upper and lower limits, and/or dimension)
- 36: Upper limit now! (sets the upper limit – 20 mA)
- 37: Lower limit now! (sets the lower limit – 4 mA)
- 40: setting constant current output (can be very useful during testing)
- 41: Device self-test, sends back the result.
- 42: Master reset (setting factory default)
- 50: Reading assignment status of the primary variable (PV), the secondary variable (SV), the tertiary variable (TV) and the quaternary variable (QV). This can not always be read unambiguously, in most cases it can be found in the manual of the device.
- 109: Switching „Burst" mode on and off.

1.1.4.3 Device –specific commands

These commands are specified by the manufacturer. A description of the commands can be found in the device manual.

2. TECHNICAL DATA

TYPE		P□□ - 1□□-□
Outputs	Transmitter Power Supply	30 V DC / 60 mA (For Ex Version: 25 V DC / 22 mA)
	Display	128 x 64 dot-matrix
	Analogue	Max. 2 galvanically isolated 4 … 20 mA outputs, max load of 500 ohm, with over-voltage protection
	Relay	Max. 4 SPDT, 250 V AC, AC1, 5 A
	RS 485 interface	Galvanically isolated, HART protocol
	HART	Output signal level: 0.5 ±0.1 V_{pp} trapezoid 1200 / 2200 Hz Minimum level of Input signal: 50 mV_{pp} Inbuilt sensor resistance: 255 ohm.

TÍPUS		P□□ - 1□□-□
Connecting cables	Power Supply, Relays, analogue 4 … 20 mA	0.5 … 2.5 mm^2 wire cross-section
	RS 485 interface	Shielded, twisted cable pair with a cross section of 0.5 … 2.5 mm^2
	HART line	Below1500 m shielded, twisted cable pair with a min.cross section of ∅0.5mm Above 1500 m shielded, twisted cable pair, with a min. cross section of ∅0.8mm max. resistance : 75 ohm, max.capacitance : 200 nF
Number of powered transmitters		Max. 15 non-Ex (max. 4 Ex) transmitters
Power supply / Power consumption / max. power supply		85 … 255 V AC 50 … 60 Hz / 12 VA / 255 V_{eff} 11.4 … 28 V AC 50 … 60 Hz / 12 VA / 28 V_{eff} 11.4 … 40 V DC / 11 W / 40 V DC
Fuse		85 … 255 V AC 50 … 60 Hz T400 mA 11.4 … 28 V AC 50 … 60 Hz és 11,4 … 40 V DC T1A
Housing material		Polycarbonate (PC)
Mounting		Wall mounted
Ambient Temperature	P□C, P□D, P□W	-20 °C … +50 °C
	P□H	-30 °C … +50 °C
Ingress protection		IP 65
Ex marking		⟨Ex⟩ II (1) G [EEx ia] IIB
Intrinsically safe output limitation data		U_o = 30 V I_o = 140 mA P_o = 1 W L_o = 4 mH C_o = 200 nF
Electrical protection		Class I / III
Mass		0,9 kg

2.1. ACCESSORIES

- Certificate of Warranty
- User's and Programming manual
- Declaration of Conformity
- 2 universal cable gland sealings

3. ORDER CODE

MultiCONT P □ □ – 1 □ □ – □

EXPANSION	CODE
Standard *	R
Non Expandable	E

ENCLOSURE	CODE
IP 65 wall enclosure	W
IP 65 wall enclosure + transparent cover	C
IP 65 wall enclosure + loackable transparent cover	D
IP 65 wall enclosure + loackable transparent cover + heating	H**

INPUT	KÓD
1 HART unit	1
2 HART units	2
4 HART units	4
8 HART units	8
15 HART units	M

OUTPUT	CODE
Display only	0
1 relay	1
2 relay	2
3 relay	3
4 relay	4
1 relay + 1 4…20 mA Analogue output	5
2 relays + 1 4…20 mA Analogue output	6
3 relays + 1 4…20 mA Analogue output	7
4 relays + 1 4…20 mA Analogue output	8
4 relays + 2 4…20 mA Analogue output	9
RS 485 interface	A
RS 485 + 1 4…20 mA	B

POWER SUPPLY	CODE
85 … 255 V AC	1
24 V AC / DC	2
85 … 255 V AC Ex	5
24 V AC / DC Ex	6

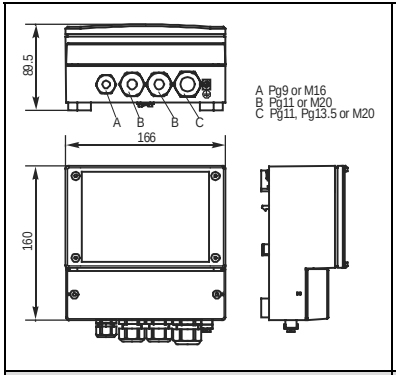
Ex: EEx ia

The order code of an Ex version should end in „Ex".

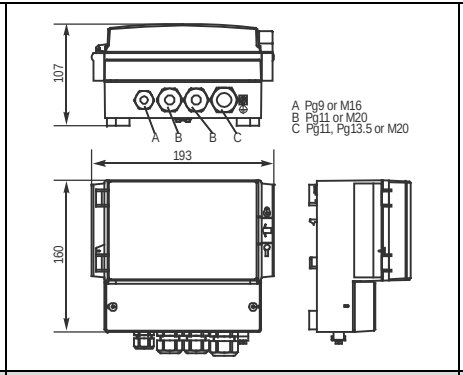
* The system can be expanded using Relay, Analogue and Combined Modules.

** Under development

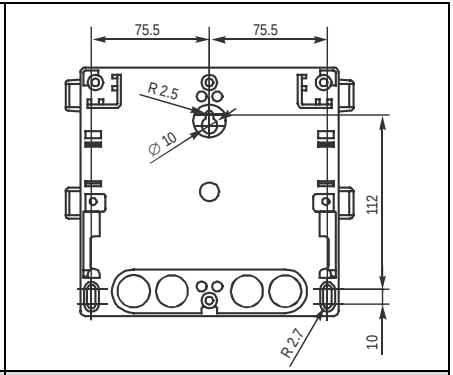
3.1. DIMENSIONS



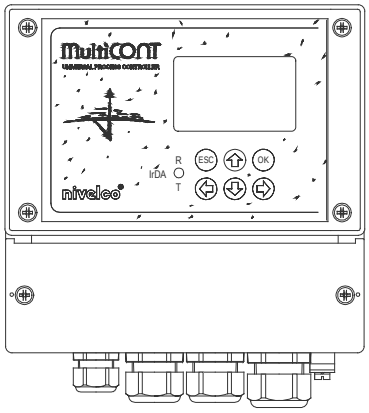
P□W



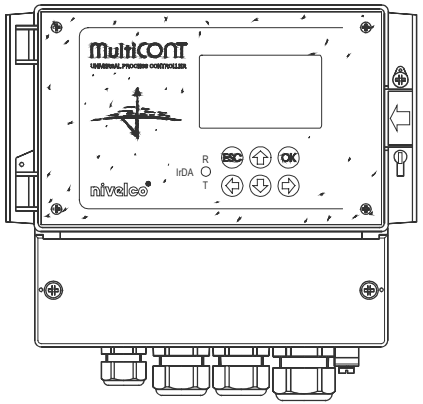
P□C, P□D, P□H



ARRANGEMENT OF MOUNTING HOLES



P□W



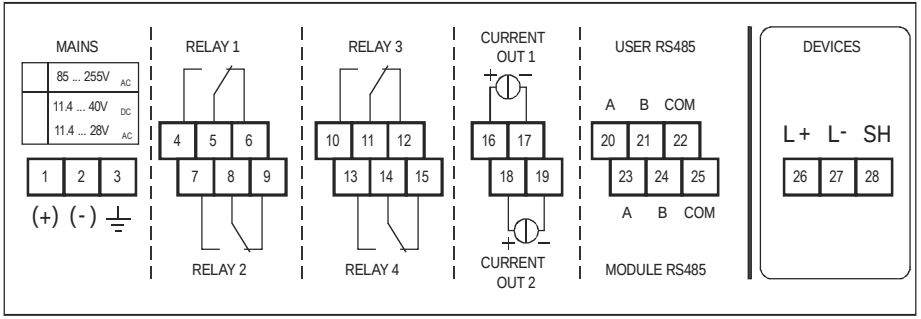
P□C, P□D, P□H

3.2. CONDITIONS OF USE OF THE EX UNITS

- The units should be mounted outside the hazardous zone!
- Device should be protected against direct sunshine!
- The power supply and ambient temperature values must not exceed those specified in the Technical data!
- Transmitters installed in hazardous areas must only be connected to the L+ and L- terminals
- The housing of the transmitter must be grounded!
- The transmitters must be connected using shielded, twisted cable pairs!

4. ELECTRICAL CONNECTION

4.1. ARRANGEMENT OF THE CABLE TERMINALS



After loosening and removing screws fastening the cover the cables can be connected. The same cable should not be used for AC and DC as well for SELV and mains voltage.

For wiring of the transmitters shielded, twisted cable pair (STP) should be used with the length depending on the number of connected units and the electrical properties of cable.

RS485 interface: A: TRD+
B: TRD–
COM: shielding

Number of Transmitters	Cabel Capacitance (pF / m)			
	65	95	160	225
1	2800	2000	1300	1000
5	2500	1800	1100	900
10	2200	1600	1000	800
15	1850	1400	900	700

Shielding of the connecting cable between the transmitter and the controller should be grounded at one end, connected either to the internal or external part of the earthing screw.

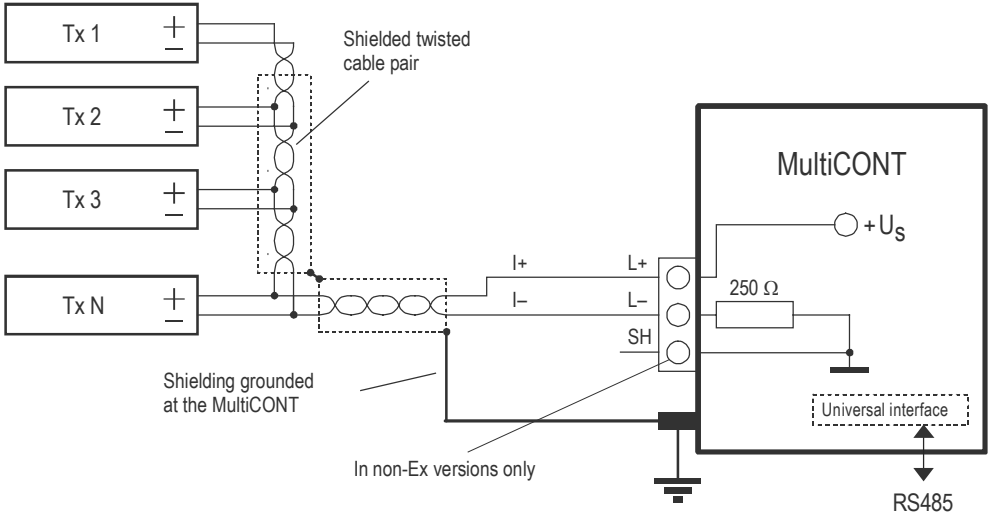
Intrinsically safe (Ex) transmitters should be connected through the terminals L+, L– to the controller. These points are galvanically isolated from the other parts of the electronics. The output current, voltage and power are constrained power supply for the Ex transmitter is current-, voltage- and power-limited.

4.2. WIRING

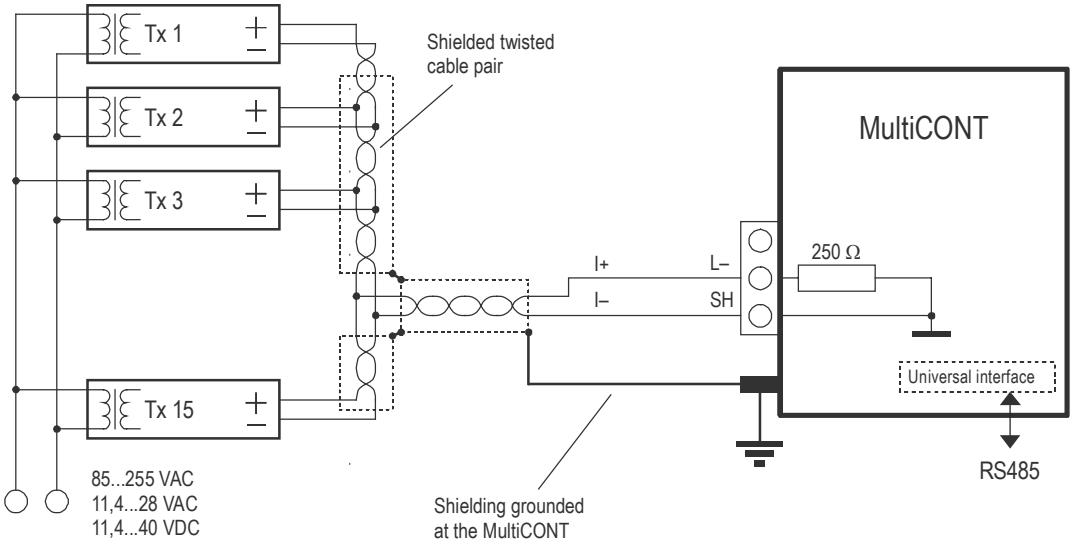
4.2.1. Transmitter connection (wiring)

Before wiring, please check: if the units (order codes) are HART-capable, the value of the loop current and also if there are two or more units with the same "Short address". (See 5.2. Steps of commissioning)

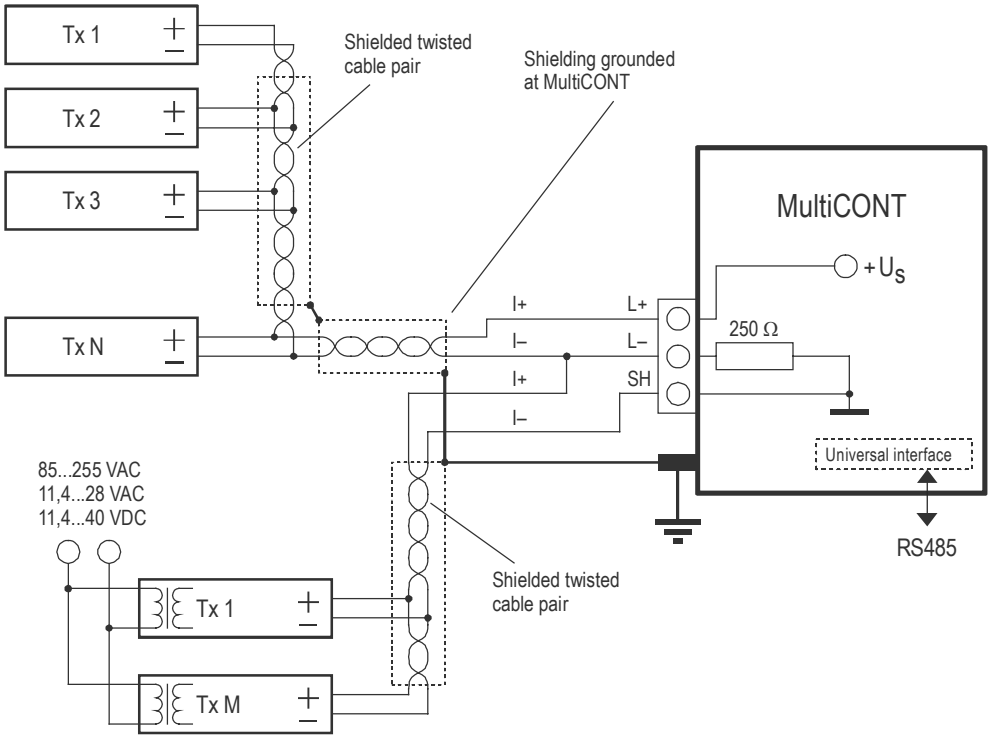
4.2.1.1 Wiring of 2-wire units (transmitters)



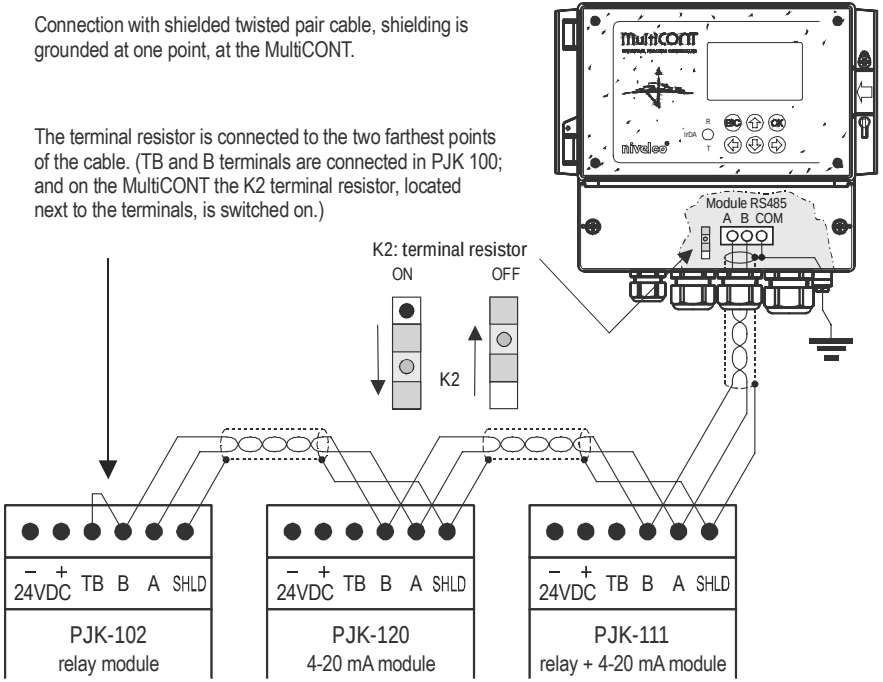
4.2.1.2 Wiring of 4-wire units (transmitters with separate power supply)



4.2.1.3 Wiring of Combined Systems (containing both 2- and 4-wire transmitters)



4.2.2. Wiring of Universal Interface Modules (UIM-s; order code: PJK-100)


Connection with shielded twisted pair cable, shielding is grounded at one point, at the MultiCONT.
The terminal resistor is connected to the two farthest points of the cable. (TB and B terminals are connected in PJK 100; and on the MultiCONT the K2 terminal resistor, located next to the terminals, is switched on.)
MultiCONT
nivelco
Module RS485
A B COM
K2: terminal resistor
ON
OFF
K2
– + TB B A SHLD
24VDC
PJK-102
relay module
– + TB B A SHLD
24VDC
PJK-120
4-20 mA module
– + TB B A SHLD
24VDC
PJK-111
relay + 4-20 mA module

The most important rule is that the data transfer line has to be closed at both ends with a resistor, at points farthest from each other. The value of the terminal resistor depends ont he wave impedance of the connecting cable. The interface contains a 120 Ω terminal resistor, so please use a cable with appropriate impedance. A configuration, whereby there aren't 2 terminal resistors, or where the 2 terminal resistors are not at the farthest points from each other is a bad configuration. In such cases, especially if the data transfer cable is too long, data transfer errors are likely occur.

The Universal Interface Modules should be connected one after another on a cable pair. Star-shaped topology is forbidden. The maximum length of the cable 1000m, but in this case a cable with shielded, twisted pair of wires (STP, Shilded Twisted Pair) must be used. The capacitance of the cable should be less than 100 pF/m. The Universal Interface Modules connected to a system must each be given different addresses (0…31), see 5.2.1.2.

5. PROGRAMMING OF MultiCONT

During programming the following can be performed:

- Automatic detection of devices (transmitters) connected to the MultiCONT, and putting them into the list of devices. Devices not on the list are part of the system but are unable to communicate with the MultiCONT (see 5.2.3 Main menu / MultiCONT config / DEV detect).
- Activation, inactivation of devices (transmitters) (See 5.2.3 Main menu / Devices).Theoretically all devices in the system should be working. (whether in the list or not). Devices in the list automatically become active. Inactivation can be used to temporarily disable devices from the system.
- Activation, inactivation of relays and current outputs (see Attachment 3 and 4)
- Relays and current generators of the MultiCONT should also be activated (see Attachment 3 and 4)
  Assignment of the MultiCONT outputs (relays, current outputs) to devices (transmitters)
- Formation of functional values (difference of 2 measured values, sum or average of 2 or more measured values)
- Remote programming of devices, although it is practical to program the devices in the laboratory before installation and wiring.
  (parameters of the transmitters e.g. P01, P02, etc. will be used in this Manual in the same way as described in the Installation and User's Manual)
- Programming of MultiCONT outputs (Relay and current output parameters of the MultiCONT will be identified as RP1, RP2, RP3 and CR1, CR2, CR3 respectively).

The programming of systems involving the MultiCONT universal interface assumes a sound knowledge of both the HART standard and the programming of the connected devices.
During programming full scale of operation such as polling of devices, functioning of the relays and current outputs will be maintained.

Modifications will be automatically saved upon returning back to measurement mode.

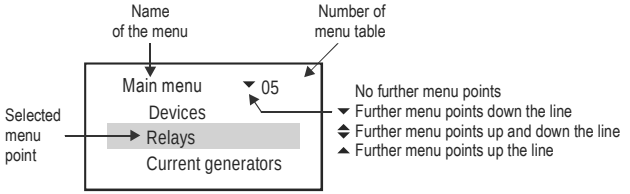
If the MultiCONT is left in Programming Mode, it will automatically return to measurement 5 minutes after the last key was pressed (modifications will be saved!).

5.1. STEPS OF PROGRAMMING

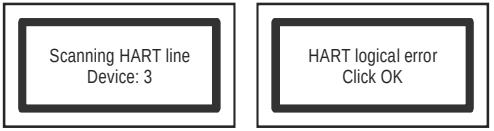
Programming can be done using the 6 programming keys with the help of the 128x64 point graphic screen. There are three different kinds of images

– Measurement / operation images (marked with capital letters in the upper right corner (Appendix 5):
M Measurement, see 5.10 Measurement mode
Bargraph image (output range)
U User image, see 5.4 MultiCONT configuration
R Relay assignment table
C Current output assignment table
E Error list, see 6. Error codes

– programming and: configuration images



– Box messages / warnings indicate steps taken by the unit or those to be performed:



See a summary of the programming below. A complete menu system is in Appendix 2. The relevant menu item and the valueor character to be edited appears in a highlighted form.

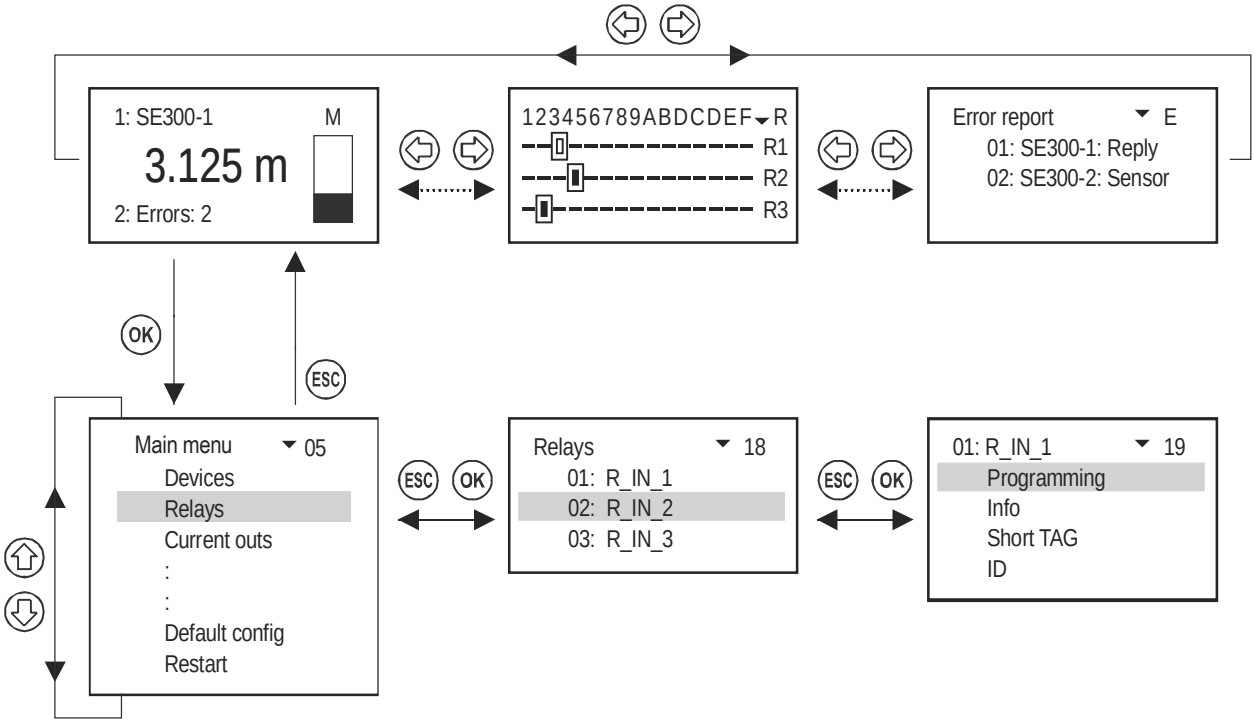
(⇩) and (⇧) are used to select options within the menu. The buttons are repetitive i.e. steadily pressing the button results in continuous stepping (the menu repeats at the end).

Programming mode can be entered and a menu item can be selected by pressing (OK) and exited by pressing (ESC).

The (⇦) and (⇨) buttons are used for editing parameters with numbers or text, selection of local values or for character positioning and for selection in some sub-menus (e.g. Relay functions). Repeating function keys (⇩) and (⇧) are used for scrolling numbers and characters when editing parameters with numbers or text. (These two buttons are dual-functional - steady pressing results in continuous stepping up-down and in jumping to the beginning at the end). Use (ESC) to acknowledge (quit) error messages (deletion of the error list).

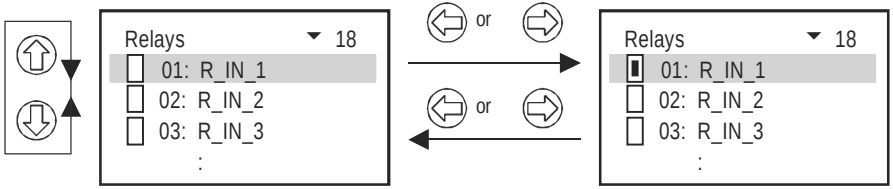
5.1.1. Scrolling and selecting menu items

The various measuring modes (M, B, U, R, C, E) can be selected using ⇦ and ⇨
OK and ESC the Main menu can be entered and left respectively.
The desired menu item can be selected using ⇩ and ⇧ (repetitive functioning i.e. steady pressing results in continuous stepping and in jumping to the beginning at the end).



5.1.2. Activation (of devices, relays and current outputs) selection (of language and operation mode)

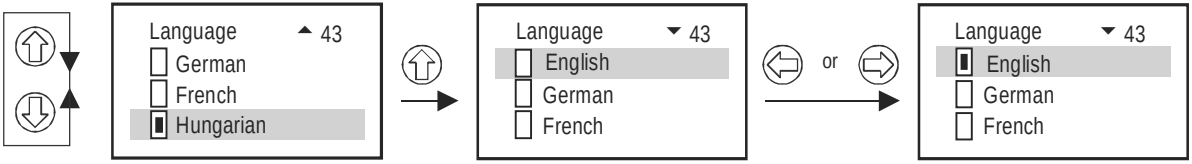
Devices on the list may be active (▮) or inactive (☐). Only active devices will be queried. Active relays and current outputs would operate according to their configuration, inactive relays are de-energized while inactive current outputs remain 0 mA.



No active relay. R_IN_1 is active

Use ⇦ and / or ⇨ to switch between active and inactive relay states.

Selection of the various modes (Relay mode, current output mode, language, etc.) is done similarly.



After selection, the chosen language is automatically activated.

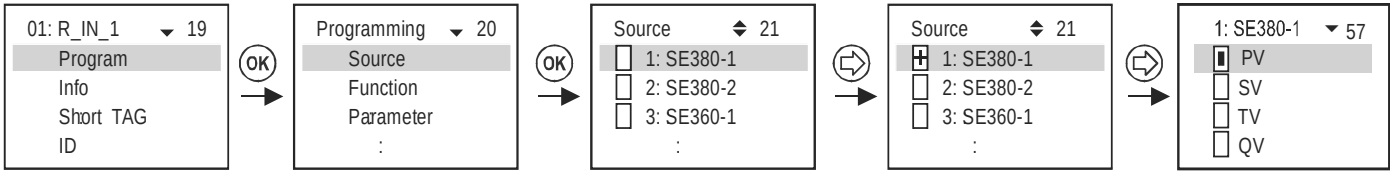
5.1.3. Assignment of outputs (relay and current) to the device

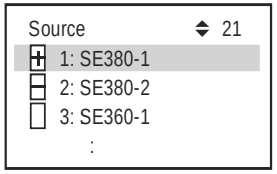
During configuration, the relays and current outputs should be assigned to the field devices and to their variables (PV, SV, TV, QV):

- ⊞ Value has a positive sign (for summation)
- ⊟ Value has a negative sign (for differential measurement)
- ▮ Values form devices marked this way will be averaged

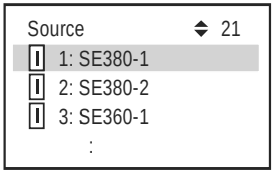
The above settings can be changed using ⇨ and ⇦.

Assignment of device SE380-1 to the relay R_IN_1 in the MultiCONT should be performed as below:





Relay R_IN_1 is controlled by the difference of the measured values of SE380-1 and SE380-2



Relay R_IN_1 is controlled by the average of the measured values of SE380-1, SE380-2 and SE360-1

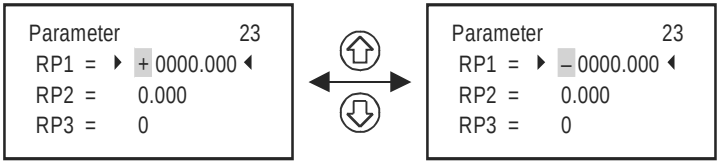
Important: If there are more than one devices (sources) assigned to a relay (difference or average) then those devices should be programmed to measure the same parameter (DIST, LEV, ...) in the same engineering unit (m, ft, inch, ...)
Otherwise we would receive an error message (Program). See 5.7, 5.8 and 6.

5.1.4. Entering parameter values

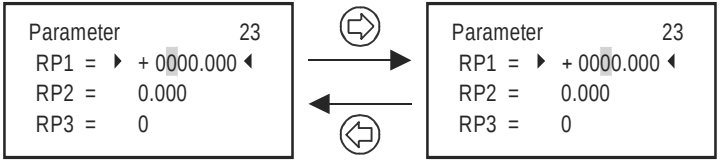
Parameters have signs and absolute values. Positioning the cursor to the sign and digits can be done using ⇦ ⇨ .

⇧ and ⇩ are for modifying the value of either the sign or the digit.

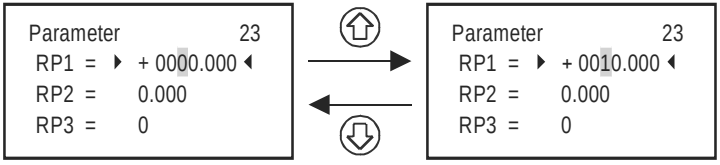
Switching between the (+) and (-) signs



Changing cursor position



Modifying the value of the digit (no carry-over)



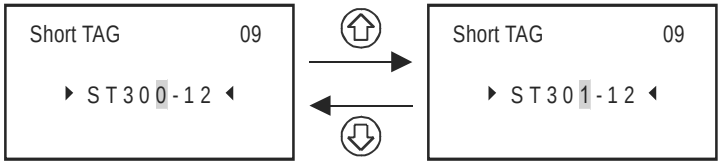
ESC can be used to quit without saving.

To save the parameters, press OK after RP3.

5.1.5. Editing character variables

Scrolling order of staves:

ABCDEFGHIJKLMNOPQRSTUVWXYZ [\ ] ^ _ ! ” # $ % & ’ ( ) * + , - . / 0123456789 : ; < = > ? @
The character being edited is displayed in INVERTED mode.



5.2. STEPS OF COMMISSIONING A MULTICONT NETWORK

Steps of commissioning:

- Preparing transmitters and Universal Interface Modules. (see chapter 5.2.1) Transmitters should be given a unique „Short address”. If there are multiple transmitters, then the addres should not be zero!
- Placement of devices in the loop into the device list. See chapter 5.2.3
- Configuration of the state of the transmitters. Devices (transmitters) placed in the device list during the detection process automatically become active i.e. the MultiCONT queries them constantly. This can be avoided by setting their state to be inactive (see chapter 5.2.3)
- Detecting Universal Interface Modules: The detected modules (relays, current outputs) become inactive, meaning that MultiCONT does not control them.
- Relay configuration: The relay should be assigned to one or more transmitters (sources), the mode of operation (function) should be specified, the switching points should be configured (parameters RP1…RP3), and then it should finally be activated. See chapter 5.7.
- Current output configuration: Similar to the relay configuration, see chapter 5.8.

5.2.1. Preparation of the Transmitters and the Universal Interface Modules.

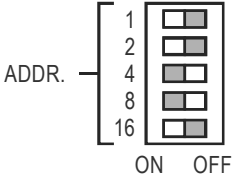
5.2.1.1 Preparation of the Transmitters

During this process, under laboratory conditions it is recommended to cross-check the "Short address" (P19 or P13, see table to the right) and the configuration of the current outputs of the transmitters. The loop current of the ordinary MultiCONT (non-Ex) is max. 60 mA, and is max. 22 mA for the Ex certified version. If the loop current exceeds this value the voltage at the terminals of the transmitters will be too low for the transmitters to start to work. In networks with more than one field device the short addresses of the units should be set between 1 … 15 and then the current of the transmitters will be automatically limited to 4mA. This value can be overwritten in the constant current output configuration parameter (Parameter P08, see table to the right). The point is that the loop current must not exceed the given limits.
A further condition of proper operation is that 2 or more devices cannot have the same "Short Addresses".

data for NIVELCO made devices				
DEVICE TYPE	„SHORT ADDRESS"	CONSTANT CURR. PARAMETER	DEVICE TYPE ID	DEFAULT „SHORT TAG"
EchoTREK 4 wire	P19	P08	1	XXXXXX where xxxxxx is the order or type code of the transmitter e.g.: STA380
EchoTREK 2 wire			3, 4	
EasyTREK			2	
NIVOCAP			5	
NIVOTRACK			6	
NIVOPRESS	P13		21	DB500
UNICONT			22, 23	PDF400
THERMOCONT			20	TB500

5.2.1.2 Preparing of the Universal Interface Modules

The Multicont can be expanded by a maximum of 32 Universal Interface Modules. They can be differentiated from each other using their „Short Addresses". Two or more modules with the same address must not be in one system. Configuration is possible using the row of DIP switches that can be found on the top of the modules (0…31).



Example for setting the address:
4+8=12, this is the „Short Address" of the module.

5.2.2. Wiring

Wiring has to be done according to the previous instructions (See chapters 2. Technical Data and 4.1 Arrangement of cable terminals)

5.2.3. Commissioning the MultiCONT

Switching on initiates a test process, during which MultiCONT tests the integrity of the memory where its settings are stored (See 5.9 The Boot Process)
This 50 sec lasting process can be accelerated (to about. 10 sec) by pressing key ESC
If everything goes perfectly, then the following

message appears on the screen, implying that the device table - the object of the query - is empty.

To choose a programming Language (English, German, French, Hungarian) select the Language menu item under "Main menu"/"MultiCONT config"/"Lanquage" using the ↑ and ↓ buttons and confirm it using the → button. From here on, the device will function using the selected language.

To detect devices in the loop select the "Main menu"/"MultiCONT config"/" DEV detect" program.

IT IS ESSENTIAL not to confuse the ***Short address*** with the ***List-tag*** of the units. In order to make is possible to search and identify HART-capable devices, it is necessary to assign short addresses ranging from 1 …. 15 to the devices during their (laboratory) programming. MultiCONT however registers the devices on the basis of the List-tags ranging from 1, … 8, 9, A, B, … F.

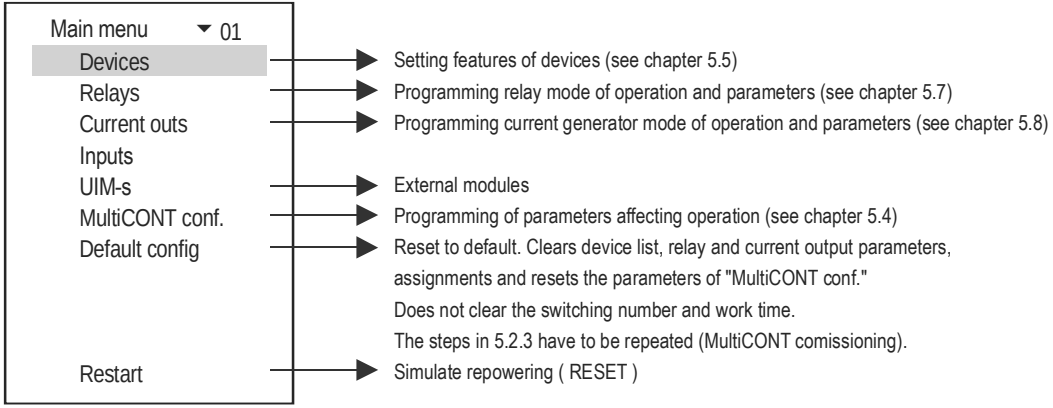
At this stage configure the settings specific to the functioning of the system (display, lighting, etc.) under "Main menu" / "MultiCONT config". See chapter 5.4.

Relays (See chapter 5.7) and current outputs (see chapter 5.8) should be programmed in accordance with the requirements of the application.

Settings can be protected via "Main menu"/"MultiCONT config"/"Password" with a secret code (software protection) and by using the program protection switch K1 (hardware protection) on the back of the front board (see chapter 7).

5.3. MAIN MENU

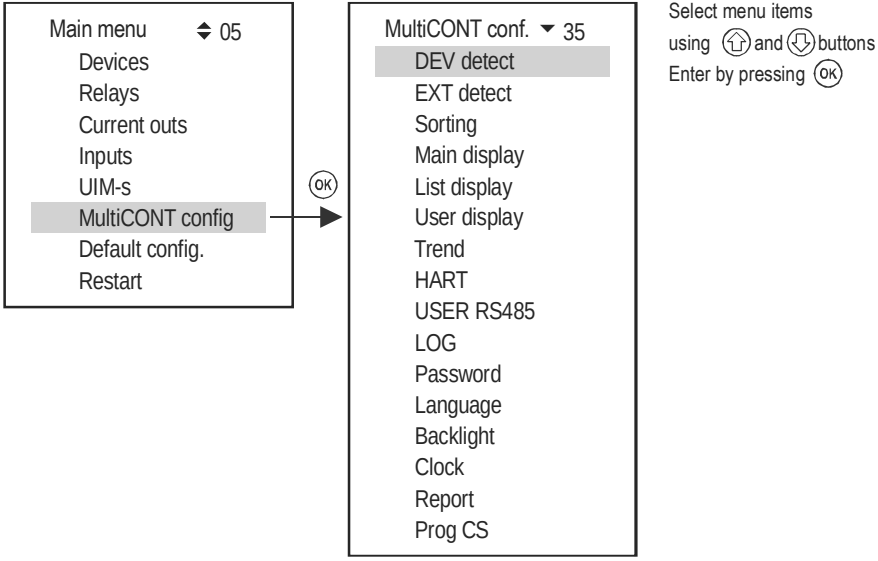
The Main menu can always be accessed from measurement mode by pressing OK.


Main menu 01
Devices
Relays
Current outs
Inputs
UIM-s
MultiCONT conf.
Default config
Restart
Setting features of devices (see chapter 5.5)
Programming relay mode of operation and parameters (see chapter 5.7)
Programming current generator mode of operation and parameters (see chapter 5.8)
External modules
Programming of parameters affecting operation (see chapter 5.4)
Reset to default. Clears device list, relay and current output parameters,
assignments and resets the parameters of "MultiCONT conf."
Does not clear the switching number and work time.
The steps in 5.2.3 have to be repeated (MultiCONT comissioning).
Simulate repowering (RESET)

The structure of the menu (***Appendix 2***)

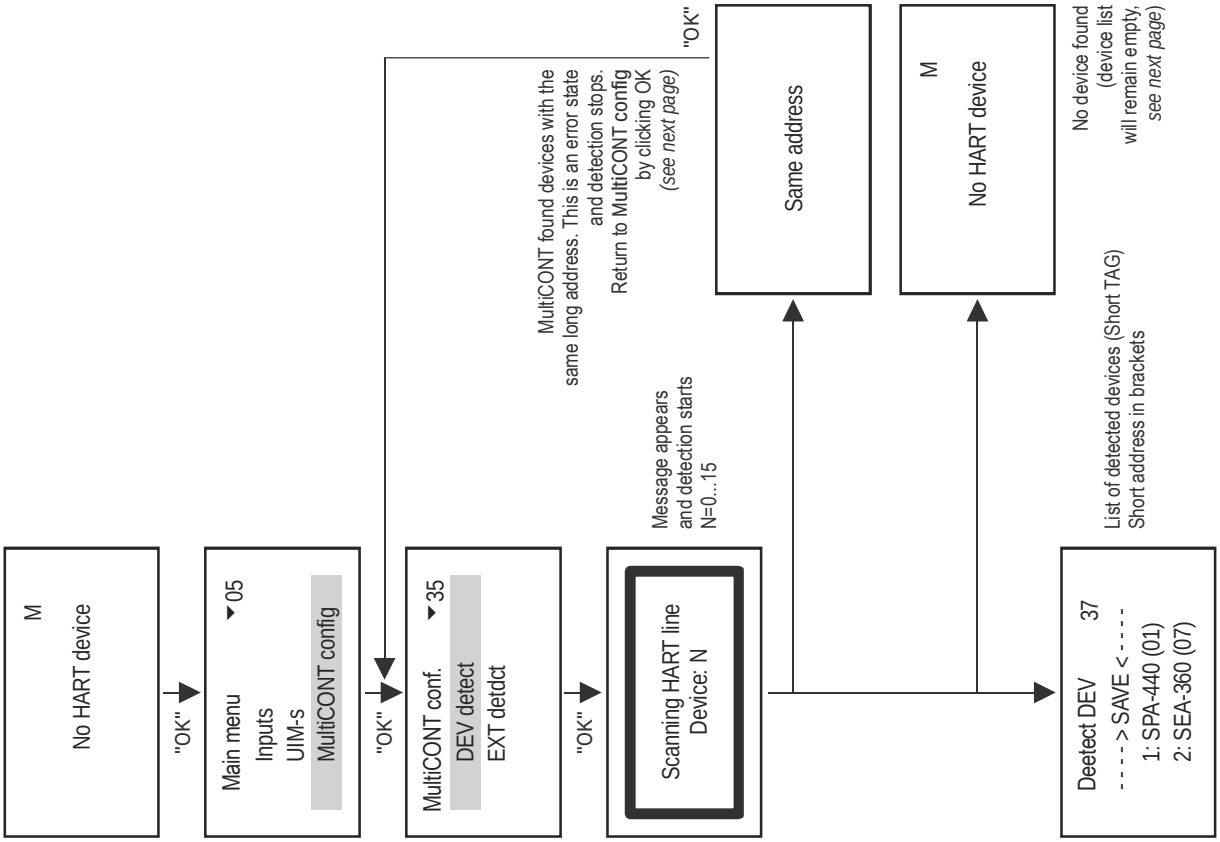
5.4. MULTICONT CONFIGURATION

The selected menu item appears in inverted mode on the display, and is marked in grey in this manual.



5.4.1. DEV detect:

Queries the transmitters via HART line from 0 to 15, and lists them with 1…9, A, B, C, D, E, F tag.



MultiCONT detects devices by means of the Short address (that is why two or more devices must not have the same Short address) After detection however, query will be performed using the Long address that consists of the following three parts.

- Manufacturer's ID: (See APPENDIX 1. At the end of the Manual (for Nivelco products it is:151)
- Device type ID: (See table under 5.2.1.1 Preparation of transmitters)
- Device ID: number generated during production (0…16777215)

When detection stops with the „Same Long address" error message there are two ways to identify the devices with the same Long address

- Devices should be removed one by one until DEV detect program can run to completion
  Obviously the address one of those devices remained in the loop is the same as the address of the unit last removed.
  Then reconnecting the devices one by one again, after detection, the Factory ID, Device Type ID, and Device ID can be read in from the "Main menu"/"Devices" menu item (See chapter 5.5 programming devices)
- The Long addresses of the transmitters can be read using the Eview configuration software (preset to work with Short Addresses) provided with HART capable devices

Since the Long address can not be modified please send such a unit back to the manufacturer, or call our Export Department for help.

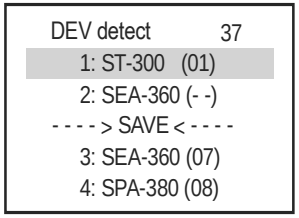
Question: what happens if the MultiCONT does not find all the devices?

1. One of the transmitters is not HART-capable. Check the transmitter type on the name plate.
2. There are more devices in the system than the given MultiCONT can handle (..this depends on the type, see chapter 3 Order Code). The number of devices that can be handled can be read in the "Main menu"/"MultiCONT config"/"Report"/"Devices" menu item (See chapter 5.4.). The interpretation of this 0nn/0mm number format is the following: "nn" is the number of devices listed and "mm" is the number of devices that can be handled (this depends on the type code, chapter 3 Order Code). In such a case where it detects more than "mm" devices, these will not be displayed in the list.
3. Faulty device. Dismount the unit and check it in the workshop.
4. Faulty wiring connection
5. The terminal voltage of the unit is small, check the configuration of the current outputs of the transmitters (See chapter 5.2.1.1 preparation of transmitters)
6. The device does not respond
   - Is there any voltage between terminals L+ and SH? If no, then the output is faulty
   - If there is voltage between terminals L+ and SH, then check if the terminals L+ and SH are short-circuited or if there is an open-circuit between the terminals L+ and L-.

Then, the next steps will be adding the device to the list, and setting the device.

Searching result may be the following:

No device was found in the loop.

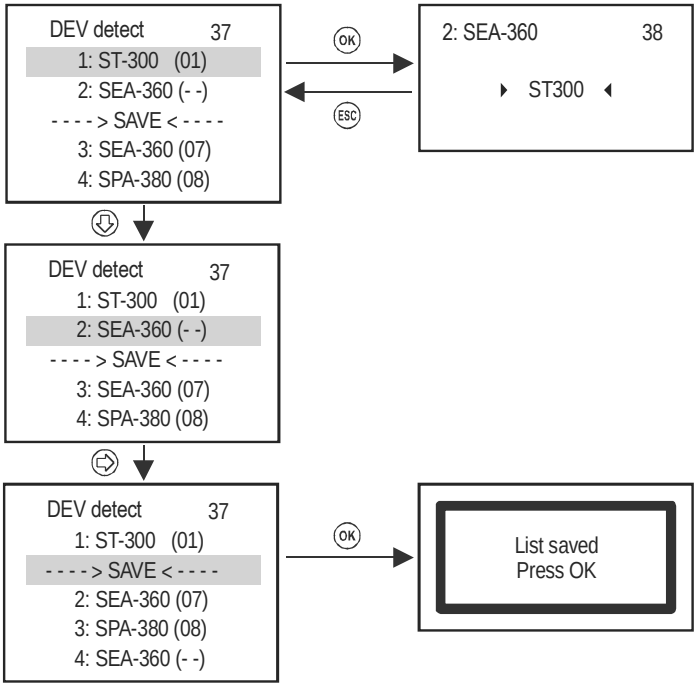


The devices above the --->SAVE<--- line are the ones included in the list. This list is empty if the unit is either newly manufactured or if reset („Mainmenu"/"Default"). The units under this line are not int he list, but have responded to a query. The „Short Address" (Polling Address) appears in brackets. Whereby a unit in the list responds, the „Short Address" will appear in brackets, otherwise a (--) will appear instead.

Upon selecting any unit that has responded (either above or below the line) an pressing „OK", the „Short Tag" can be changed.
MultiCONT only handles units above the line.

Reorganising the list can be done in the following manner:

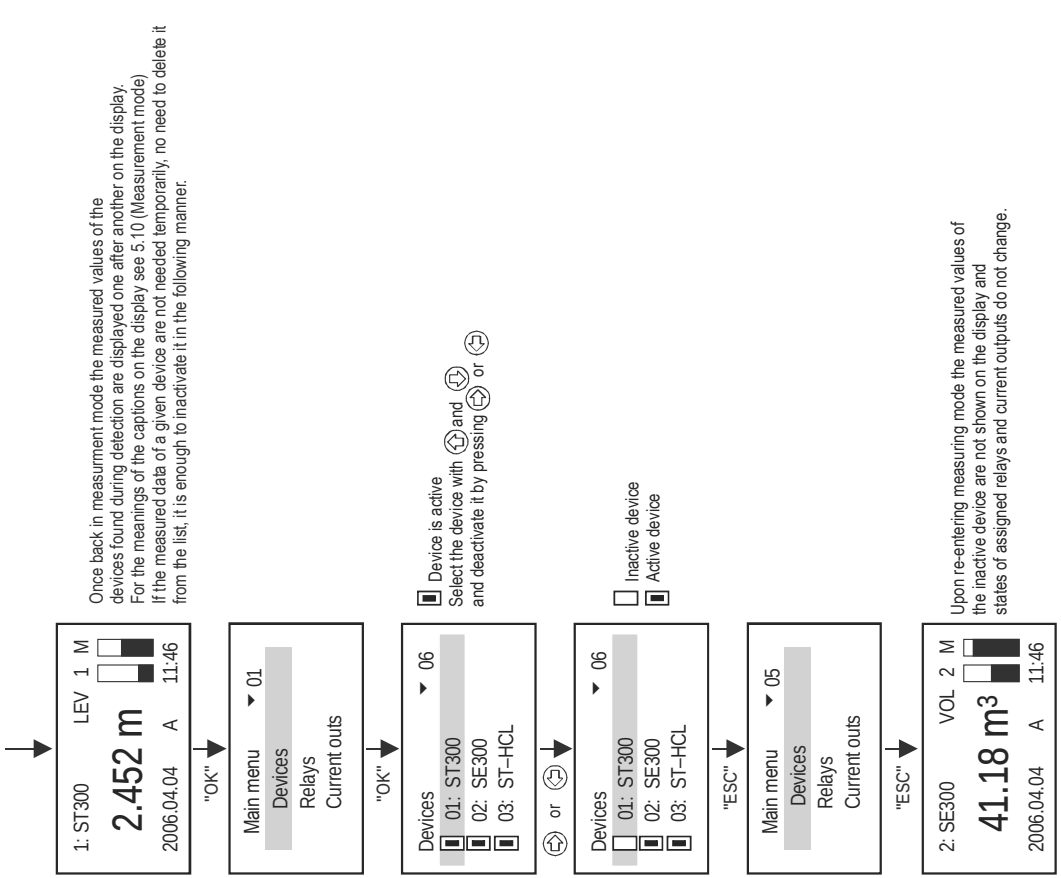
- Select the unit using „↑" and „↓"
- Press → to move the unit to the end of the list at the other side of the line
- Selecting the SAVE line saves the list above the SAVE line.



„Short TAG" can be changed

Saving the list above the ----> SAVE <---- line

The units in the saved list automatically become active!!


1: ST300 LEV 1 M
2.452 m
2006.04.04 A 11:46
"OK"
Main menu 01
Devices
Relays
Current outs
"OK"
Devices 06
01: ST300
02: SE300
03: ST–HCL
or
Devices 06
01: ST300
02: SE300
03: ST–HCL
"ESC"
Main menu 05
Devices
Relays
Current outs
"ESC"
2: SE300 VOL 2 M
41.18 m3
2006.04.04 A 11:46
Once back in measurment mode the measured values of the devices found during detection are displayed one after another on the display.
For the meanings of the captions on the display see 5.10 (Measurement mode)
If the measured data of a given device are not needed temporarily, no need to delete it from the list, it is enough to inactivate it in the following manner.
Device is active
Select the device with and
and deactivate it by pressing or
Inactive device
Active device
Upon re-entering measuring mode the measured values of the inactive device are not shown on the display and states of assigned relays and current outputs do not change.

In ideal cases, the detection process takes a few seconds.

If the HART line is noisy, and the retrial count is big, then this time can increase to 25…40 seconds.

5.4.2. EXT detect:

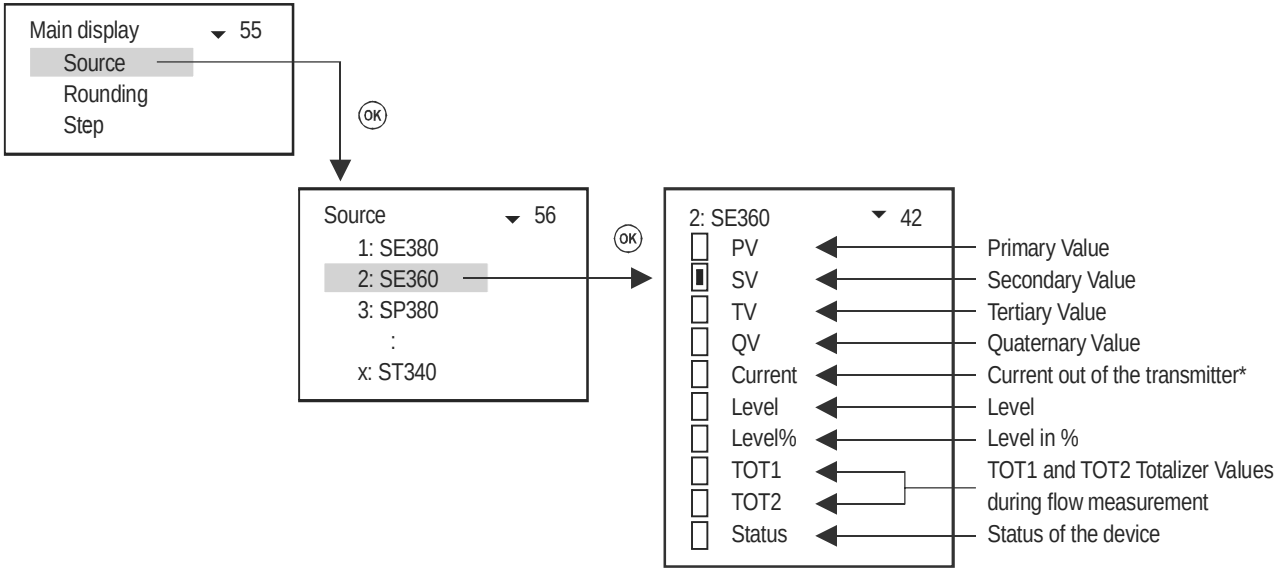
For detection of, external expansion (Relays, Current Output, or Combined) modules If available
The query process is similar to that of the EXT detect mode, the only difference being that the modules that get into the list remain in an inactive state. (See 5.2.3 Commisioning the MultiCONT)

5.4.3. Display

The display consists of 3 parts: „Main field", „List field" és „State field" See 5.10 .
Amongst these, the „Main field" and „List field" can be freely selected for each device.
The quantity to be displayed and the rounding of the decimal part can be set in the „Main image".
This is where to configure the stepping of the results of the transmitters on the display.

5.4.3.1 Source

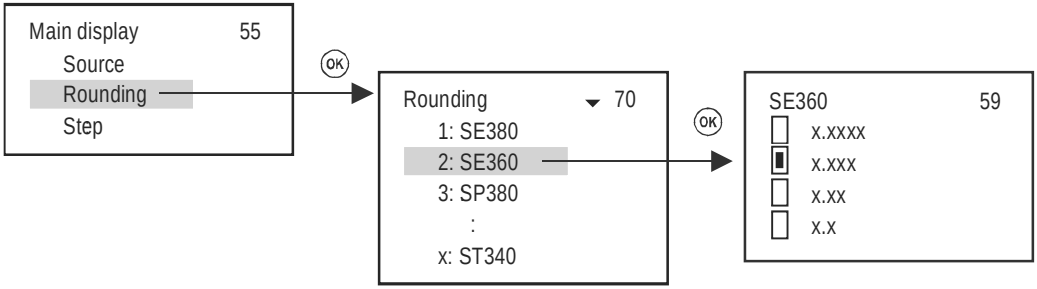
The quantity to be displayed in the “Main image” can be selected independently for each transmitter. Cross-check your selection in “Main menu”/”MultiCONT config.”/”HART”/”CommandSet”, to confirm the selection of the appropriate command containing the desired quantity.



* We can only talk about the output current, as a display quantity, if there is only one device in the system, And if the „Short Address” is zero, i.e., if the current output is not constant.

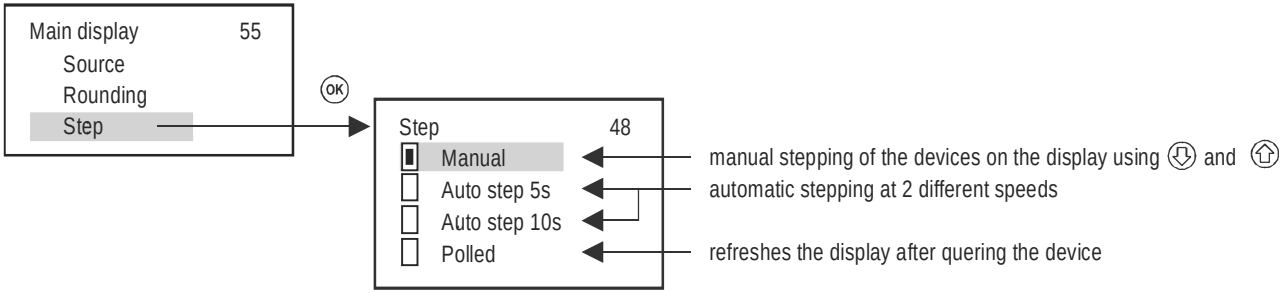
5.4.3.2 Rounding

The MultiCONT by default rounds to 4 decimal places i.e., the quantity is displayed with precision of 4 decimals.
The rounding is for the main image quantity only.



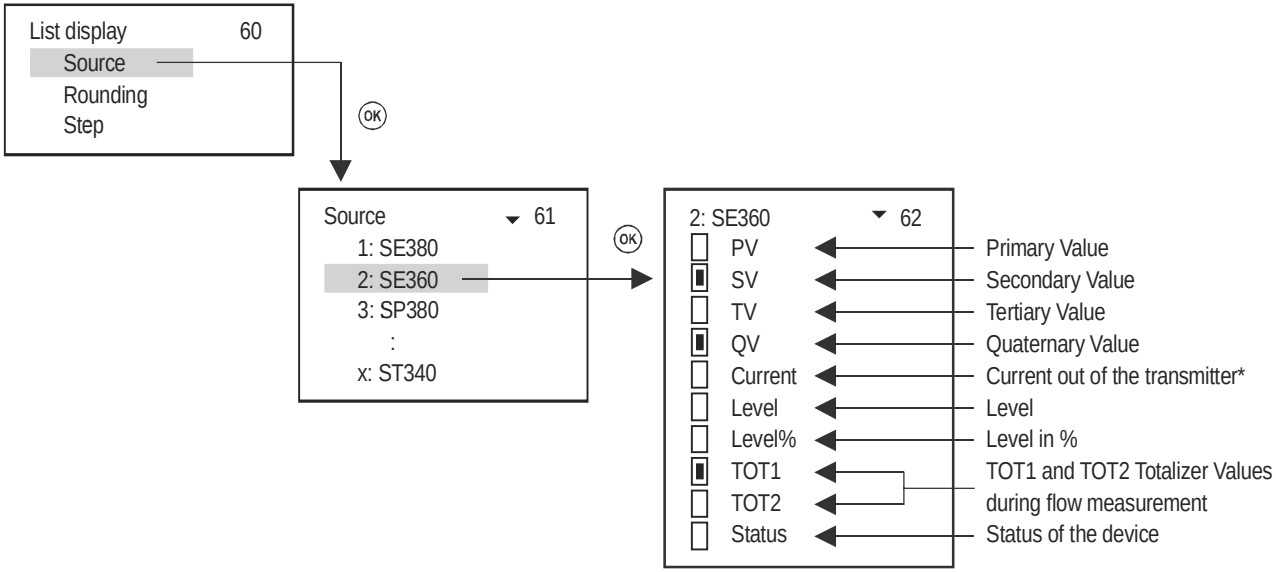
5.4.3.3 Stepping

Stepping is related to the display only. The query of the transmitters and the control of the relays and current outputs functions constantly in the background, depending on the cycle time („Main menu"/"MultiCONT config."/"HART"/"Cycle time")



5.4.4. List display

Max. three quantities can be selected.



* We can only talk about the output current, as a display quantity, if there is only one device in the system, And if the „Short Address" is zero, i.e., if the current output is not constant.

5.4.5. User Display:

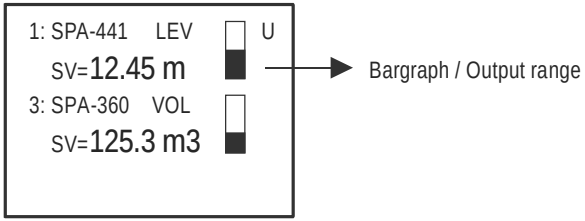
In measuring mode (See chapter 5.10) the user can select a display format besides the display showing the measured data and this can be seen in the user display. We will receive an error message in the use's image if:

- Only one device is selected to display double, difference or average.
- In the case of difference or average display for given transmitters, the values or dimensions are different.

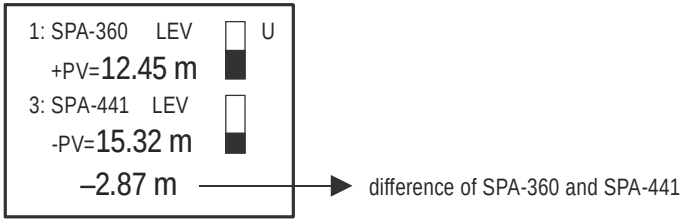
5.4.5.1 Editing the user display

5.4.5.2 The various user displays

– Multiple

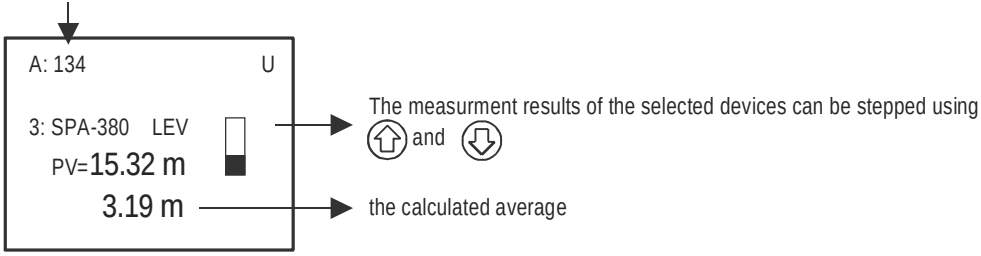


– Difference



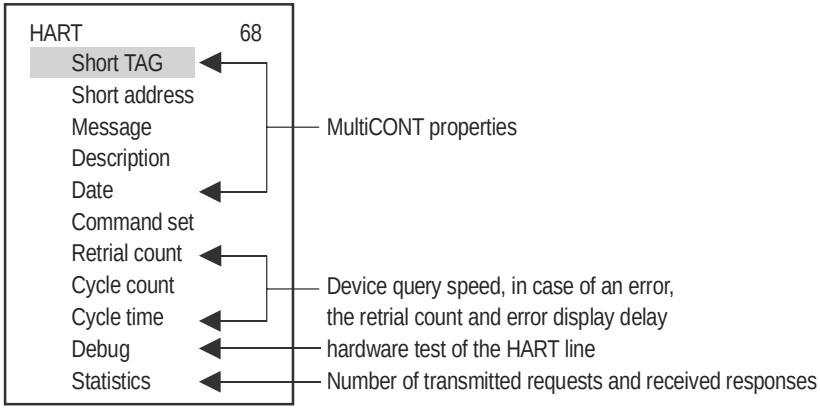
– Average

List number of devices whose average value is calculated by MultiCONT



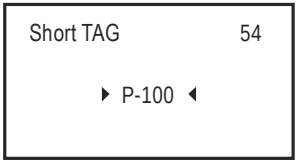
5.4.6. HART

In this menu, it is possible to configure MultiCONT properties, the settings related to the transmitter query and also to choose the HART commands which the MultiCONT uses to communicate with the devices. This is also where it is possible to test the HART line and view the statistics.



5.4.6.1 Short TAG

Arbitrary 8-character identifier

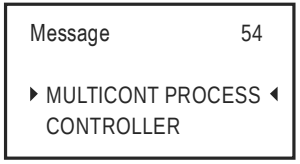


5.4.6.2 Short Address

If multiple MultiCONT-s are to be connected to a single system via RS485, then this address differentiates them.

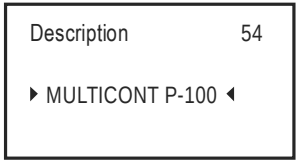
5.4.6.3 Message

An arbitrary message (usually related to the operation, and max 32 characters) can be assigned to a device.
To Switch rows use „OK" and „ESC".



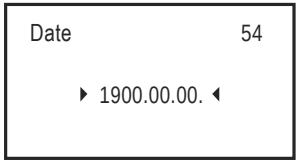
5.4.6.4 Description

An arbitrary text that can be assigned to a device (max 16 characters)

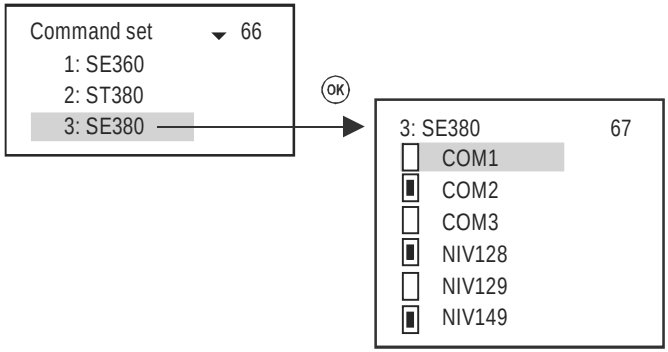


5.4.6.5 Date

The date assigned to the MultiCONT



5.4.6.6 Command Set



The communication between the MultiCONT and the devices is via different commands. The MultiCONT sends a command containing the address of the device, which responds in accordance with the standards. Some of the commands are universal, while others are device-specific. The appropriate commands have to be chosen based on the data required to control the display, relays, and current outputs. If multiple commands are selected, then the refresh time increases (display, relay, and output current modification, see 5.4.3.8)

MultiCONT uses the following commands to communicate with the devices.

- COM1: query of primary quantities/values
- COM2: the output current in mA-ben and in % (output range)
- COM3: the primary, secondary, tertiary and quaternary values

These commands can be interpreted by any device belonging to any manufacturer.

The commands below can only be interpreted by Nivelco products:

- NIV128: device specific command optimalized for DIST, LEV, VOL measurements
- NIV129: device specific command optimalized for DIST, LEV, FLOW, TOT1, TOT2 measurements, TOT1 és TOT2 in float format
- NIV149: device specific command optimalized for LEV, FLOW, TOT1, TOT2 measurements, TOT1 és TOT2 in integer format

The table below shows the contents of the responses of Nivelco-manufactured devices to given commands:

COM3: 03 Universal HART command

	EchoTREK 4-wire.				EchoTREK 2-wire.				NIVOTRACK				NIVOCAP			
	EasyTREK				EasyTREK											
P01	PV	SV	TV	QV	PV	SV	TV	QV	PV	SV	TV	QV	PV	SV	TV	QV
0	DIST	LEV	DIST	Temp	DIST	Temp	-	-	DIST	Temp	-	-	%	-	-	-
1	LEV	LEV	DIST	Temp	LEV	DIST	Temp	-	LEV	DIST	Temp	-	LEV	%	-	-
2	LE%	LEV	DIST	Temp	LE%	LEV	DIST	Temp	LE%	LEV	DIST	Temp	LE%	LEV	%	-
3	VOL	LEV	DIST	Temp	VOL	LEV	DIST	Temp	VOL	LEV	DIST	Temp	VOL	LEV	%	-
4	VO%	LEV	DIST	Temp	VO%	LEV	DIST	Temp	VO%	LEV	DIST	Temp	VO%	LEV	%	-
5	FLO	LEV	DIST	Temp	FLO	LEV	DIST	Temp	-	-	-	-	-	-	-	-

	NIVOPRESS				UNICONT				THERMOCONT							
P10	PV	SV	TV	QV	PV	SV	TV	QV	PV	SV	TV	QV	PV	SV	TV	QV
0	P*	-	-	-	Prog**	I_{be}	-	-	Temp	-	-	-				
1	P*	-	-	-	Prog**	I_{be}	-	-	Temp	-	-	-				
2	LEV	P*	-	-	Prog**	I_{be}	-	-	-	-	-	-				
3	LEV	P*	-	-	Prog**	I_{be}	-	-	-	-	-	-				

* P: pressure

** Prog: the value calculated by the device from the input current (I_{be}).
During configuration, it is necessary to set the value (pl. 4 mA=0 m^3, 20mA = 125 m^3) coresponding to the incoming 4…20mA (I_{be})

NIV128: NIVELCO device specific commands optimized for VOL measurement

	EchoTREK 4-wire.				EchoTREK 2-wire.				NIVOTRACK				NIVOCAP			
	EasyTREK				EasyTREK											
P01	PV	Base	3. Pos.	4. Pos	PV	Base	3. Pos.	4. Pos	PV	Base	3. Pos.	4. Pos	PV	Base	3. Pos.	4. Pos.
0	DIST	LEV	SR*	Curr.	DIST	LEV	SR	Curr.	DIST	LEV	SR	Curr.	%	LEV	0	Curr.
1	LEV	LEV	SR	Curr.	LEV	LEV	SR	Curr.	LEV	LEV	SR	Curr.	LEV	LEV	0	Curr.
2	LE%	LEV	SR	Curr.	LE%	LEV	SR	Curr.	LE%	LEV	SR	Curr.	LE%	LEV	0	Curr.
3	VOL	LEV	SR	Curr.	VOL	LEV	SR	Curr.	VOL	LEV	SR	Curr.	VOL	LEV	0	Curr.
4	VO%	LEV	SR	Curr.	VO%	LEV	SR	Curr.	VO%	LEV	SR	Curr.	VO%	LEV	0	Curr.
5	FLO	LEV	SR	Curr.	FLO	LEV	SR	Curr.	-	-	-	-	-	-	-	-

* SR (sensor range): Value of the difference in level between the „Maximum range" (H=P04) and the „Minimum range" (dead zone-near blocking) in % (empty tank: DIST=H $\Rightarrow$ 0%, full tank: DIST="Minimum range" $\Rightarrow$ 100%). The bargraph is necessary for display.

NIV129: NIVELCO device specific commands optimized for FLOW measurement
(TOT1 and TOT2 in float format)

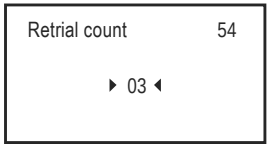
	EchoTREK 4-wire				EchoTREK 2-wire				NIVOTRACK				NIVOCAP			
	EasyTREK				EasyTREK											
P01	PV	Base	3. Pos.	4. Pos	PV	Base	3. Pos.	4. Pos	PV	Base	3. Pos.	4. Pos	PV	Base	3. Pos.	4. Pos
0	DIST	LEV	TOT1	TOT2	DIST	LEV	TOT1	TOT2	DIST	LEV	0	0	%	*LEV*	0	0
1	LEV	LEV	TOT1	TOT2	LEV	LEV	TOT1	TOT2	LEV	LEV	0	0	LEV	LEV	0	0
2	LE%	LEV	TOT1	TOT2	LE%	LEV	TOT1	TOT2	LE%	LEV	0	0	LE%	LEV	0	0
3	VOL	LEV	TOT1	TOT2	VOL	LEV	TOT1	TOT2	VOL	LEV	0	0	VOL	LEV	0	0
4	VO%	LEV	TOT1	TOT2	VO%	LEV	TOT1	TOT2	VO%	LEV	0	0	VO%	LEV	0	0
5	FLO	LEV	TOT1	TOT2	FLO	LEV	TOT1	TOT2	-	-	-	-	-	-	-	-

NIV149: NIVELCO device specific commands optimized for FLOW measurement
(TOT1 and TOT2 integer part)

	EchoTREK 4-wire				EchoTREK 2-wire				NIVOTRACK				NIVOCAP			
	EasyTREK				EasyTREK											
P01	PV	Base	3. Pos.	4. Pos	PV	Base	3. Pos.	4. Pos	PV	Base	3. Pos.	4. Pos	PV	Base	3. Pos.	4. Pos
0	DIST	LEV	TOT1	TOT2	DIST	LEV	TOT1	TOT2	DIST	LEV	0	0	%	*LEV*	0	0
1	LEV	LEV	TOT1	TOT2	LEV	LEV	TOT1	TOT2	LEV	LEV	0	0	LEV	LEV	0	0
2	LE%	LEV	TOT1	TOT2	LE%	LEV	TOT1	TOT2	LE%	LEV	0	0	LE%	LEV	0	0
3	VOL	LEV	TOT1	TOT2	VOL	LEV	TOT1	TOT2	VOL	LEV	0	0	VOL	LEV	0	0
4	VO%	LEV	TOT1	TOT2	VO%	LEV	TOT1	TOT2	VO%	LEV	0	0	VO%	LEV	0	0
5	FLO	LEV	TOT1	TOT2	FLO	LEV	TOT1	TOT2	-	-	-	-	-	-	-	-

5.4.6.7 Retrial count

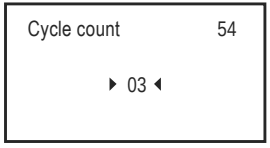
This variable determines the numberof times to repeat the HART command in case of a bad response for each device



Value: 3…10
Default: 3

5.4.6.8 Cycle count

This determines the number of error cycles permitted before assuming an error and inclusion in the error list.
The entry in the error list is deleted if communication is successful in the following cycle



Value: 1…10
Default: 3

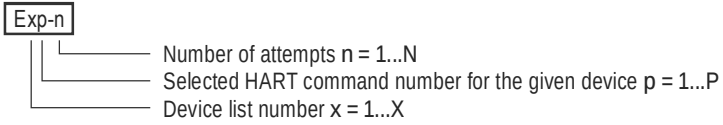
5.4.6.9 Cycle time:

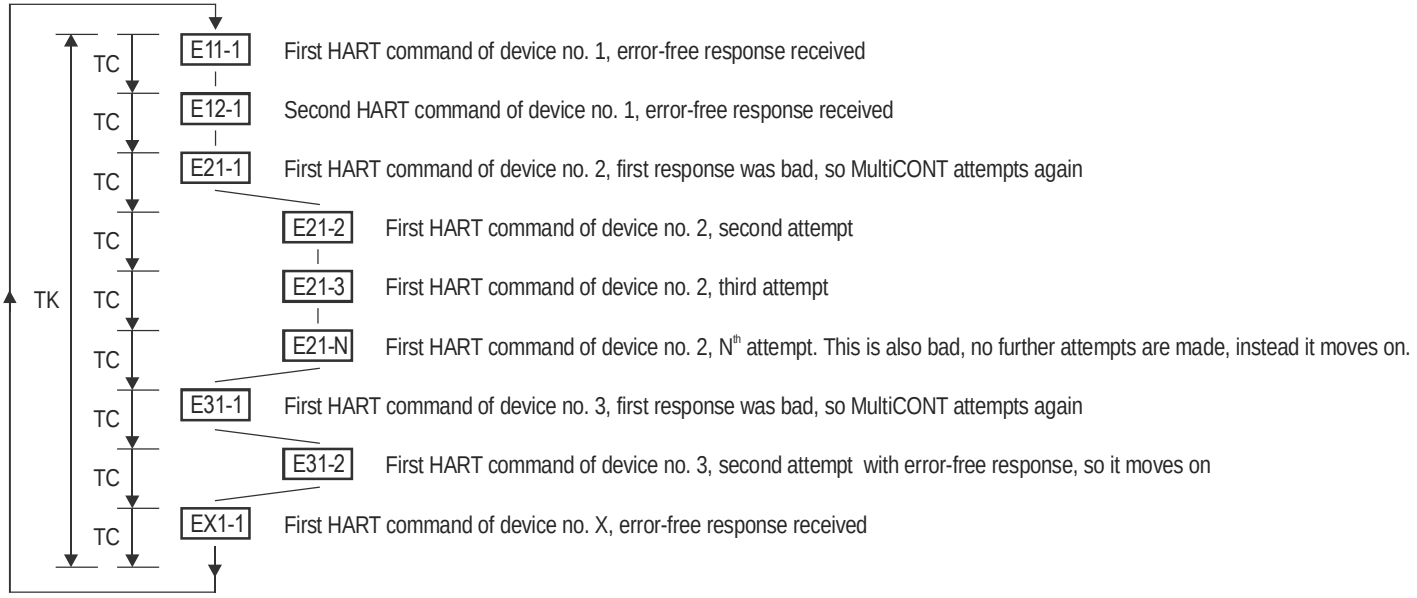
This determines the time lapse between two HART commands, in units of 100ms. If in the case of a transmitter it is necessary to send multiple commands, then this time also show the time between the commands.

Value: 5…50
Default: 5

Relationship between cycle count, retrial count, cycle time and refresh time

- The number of active devices in the system: X X=1…15, depending on the type of MultiCONT
- Retrial count (N): Number of repetitions in case of bad response, N= 3…10 (default=3)
- Cycle count (M): Number of cycles after which the MultiCONT assumes an error (inclusion int he error list) M=1…10 (default=3)
- Cycle time (T): Elapsed time between commands TC=T*100[ms]. T=5…50 (default=5)
- Number of selected HART commands: P
- Refresh time TK: The period of time after which the states of the display, relays and current outputs are refreshed.




TK
TC
TC
TC
TC
TC
TC
TC
TC
TC
E11-1
First HART command of device no. 1, error-free response received
E12-1
Second HART command of device no. 1, error-free response received
E21-1
First HART command of device no. 2, first response was bad, so MultiCONT attempts again
E21-2
First HART command of device no. 2, second attempt
E21-3
First HART command of device no. 2, third attempt
E21-N
First HART command of device no. 2, Nth attempt. This is also bad, no further attempts are made, instead it moves on.
E31-1
First HART command of device no. 3, first response was bad, so MultiCONT attempts again
E31-2
First HART command of device no. 3, second attempt with error-free response, so it moves on
EX1-1
First HART command of device no. X, error-free response received

If N*M bad responses are received from the device one after the other, then an error signal is sent which gets included int he error list.
As a result of the above, a complete turn (TK) thus depends greatly on the number of devices, the number of selected HART commands, and on the number of times a command has to be repeated due to the noisy line

TK_{min}=0.5 sec (only one device, and a perfect response)

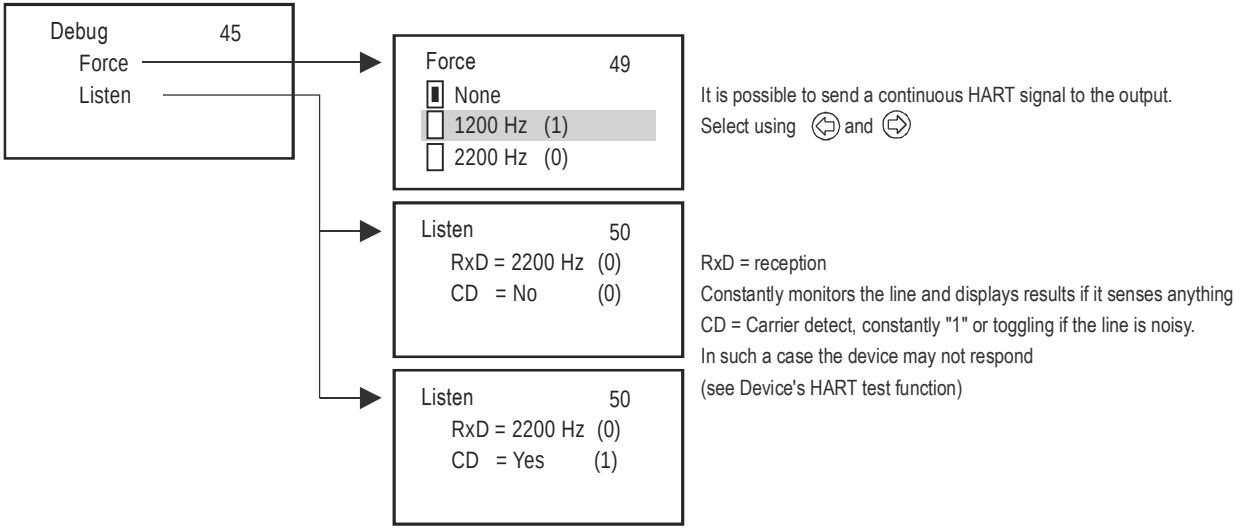
With default settings, in the case of 15 units (X=15), assuming 1 HART command per device and a noisy line such that averagely every command is repeated once:

TK= X*TC*2=15*0,5*2=15 sec

In extreme cases TK could become minutes!!

5.4.6.10 Test

It is possible to test the HART line.

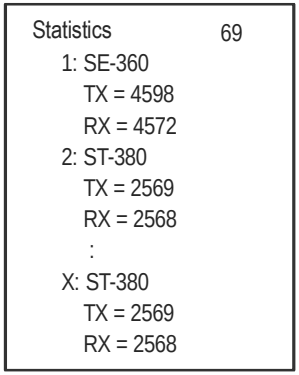


It is possible to send a continuous HART signal to the output.
Select using ⇦ and ⇨

RxD = reception
Constantly monitors the line and displays results if it senses anything
CD = Carrier detect, constantly "1" or toggling if the line is noisy.
In such a case the device may not respond
(see Device's HART test function)

5.4.6.11 Statistics

For each device in the list, the number sent HART comands (TX) and the received responses (RX) is noted. When a device is inactive, its statistics do not change. These data are lost when the MultiCONT is put off. In ideal cases, the values TX and RX are the same. It is acceptable for the number of received responses to be greater than 95% of the number of sent commands. If the deviation is big, then it is recomended to check whether the cable shielding is grounded or the quality of the grounding.



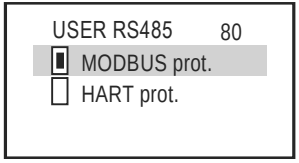
5.4.7. USER RS485

The MultiCONT User RS485 interface allows serial data transfer to the central process controller computer or to a PLC. The following can be queried from MULTICONT through the communication line:

- system properties (MULTICONT configuration, relays, current generators, transmitters, errors, number of Universal Interface Modules, etc)
- error list
- device assignment to relays or current generators
- configuration of relays and current generators
- output values of the devices

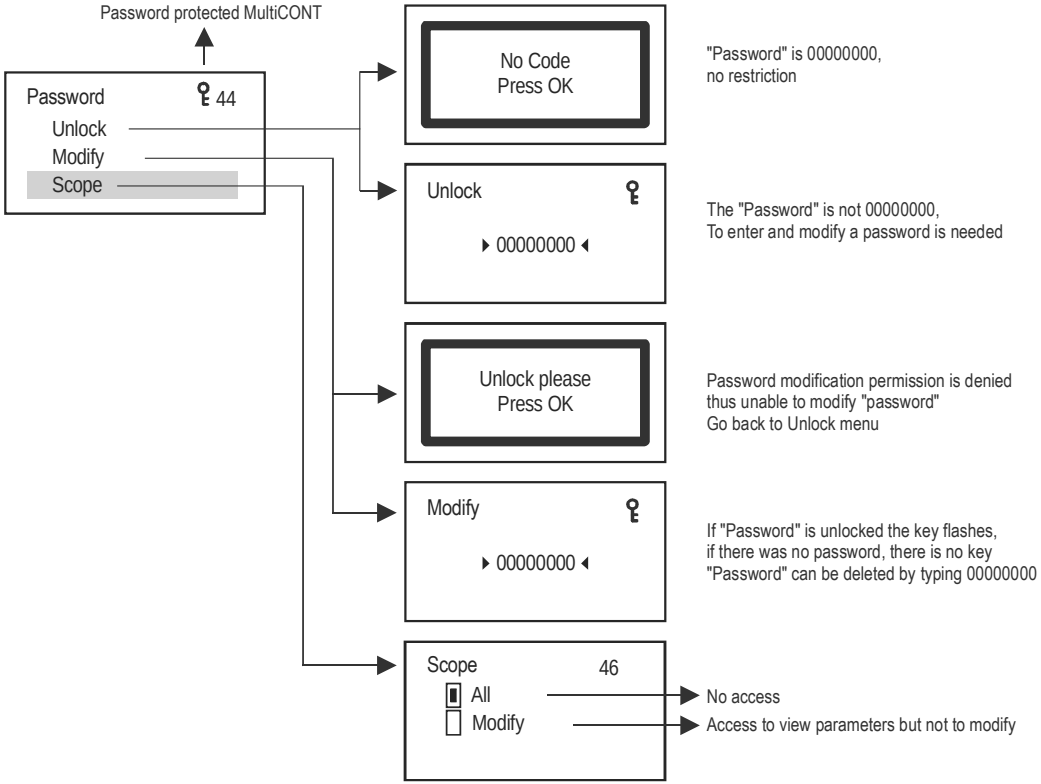
The MULTICONT units have separate addresses so they can be connected into a system (max. 30 MULTICONTs).

- 2 communication protocols are available:
- MODBUS RTU (default)
- HART 5



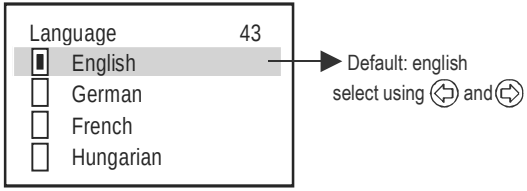
5.4.8. Secret code

The viewing and modification of MultiCONT settings can be protected witha secret code differing from 00000000.
If there is a password, the following symbol appears left of the menu identifier, and flashes after being unlocked.
The password remains temporarily unlocked untill after returning to the measuring process.



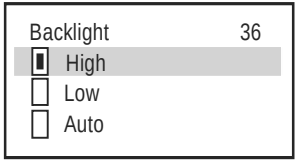
5.4.9. Language

This is where to select the language used during measurement and programming.
The selected language will be switched to immediately.



5.4.10. Background lighting

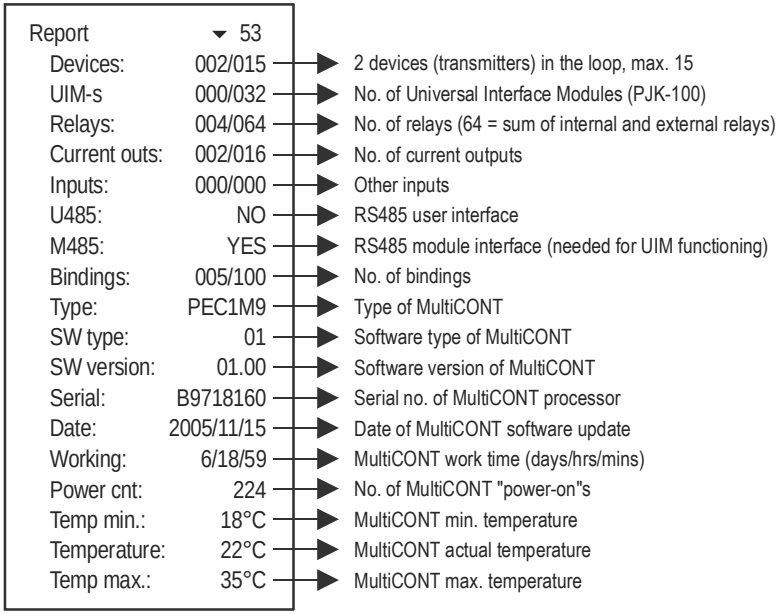
The background lighting of the display can be modified here.



In auto mode, pressing any button sets the backlight to "high".
10 s after the last button was pressed, the backlight turns off

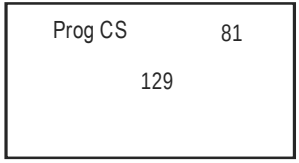
5.4.11. Report:

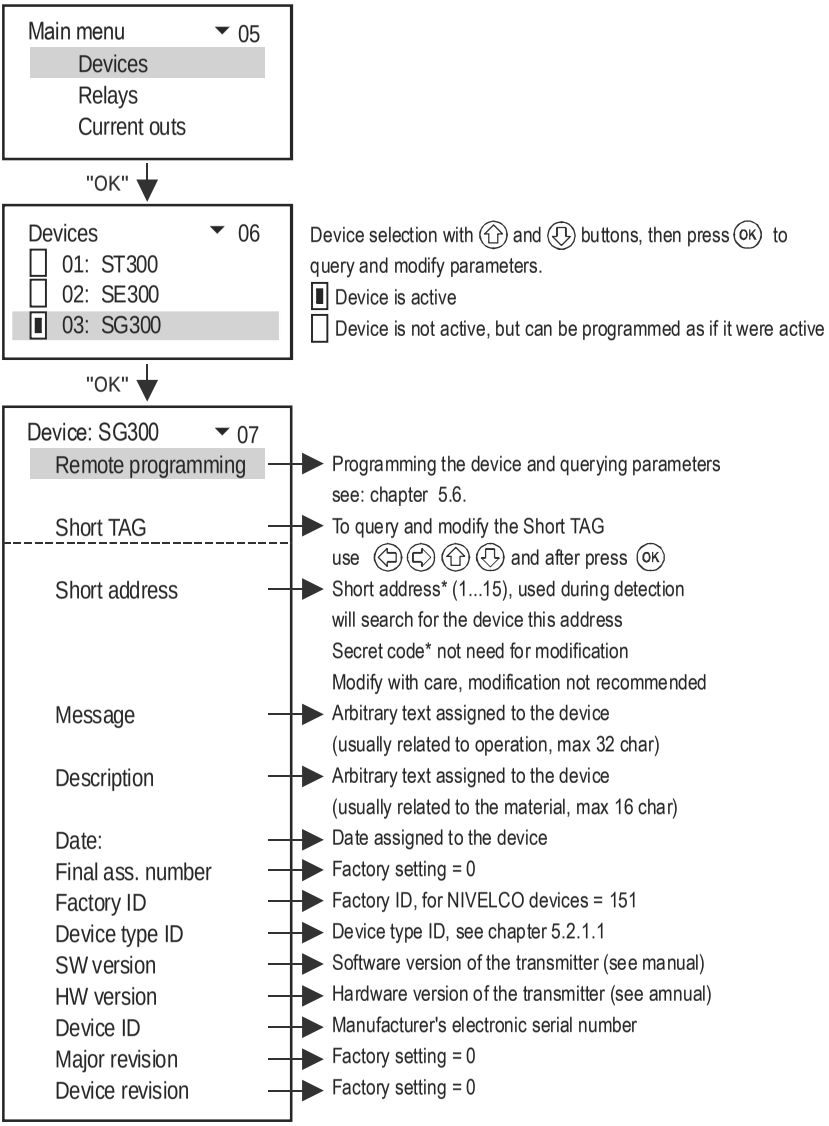
This provides information about the system structure. This displays the number of devices (transmitters), relays, current outputs, and modules int he system, and also the number that can be handled. Binding is when a relay or current output is assigned to a device.


Report ▼ 53
Devices: 002/015 → 2 devices (transmitters) in the loop, max. 15
UIM-s 000/032 → No. of Universal Interface Modules (PJK-100)
Relays: 004/064 → No. of relays (64 = sum of internal and external relays)
Current outs: 002/016 → No. of current outputs
Inputs: 000/000 → Other inputs
U485: NO → RS485 user interface
M485: YES → RS485 module interface (needed for UIM functioning)
Bindings: 005/100 → No. of bindings
Type: PEC1M9 → Type of MultiCONT
SW type: 01 → Software type of MultiCONT
SW version: 01.00 → Software version of MultiCONT
Serial: B9718160 → Serial no. of MultiCONT processor
Date: 2005/11/15 → Date of MultiCONT software update
Working: 6/18/59 → MultiCONT work time (days/hrs/mins)
Power cnt: 224 → No. of MultiCONT "power-on"s
Temp min.: 18°C → MultiCONT min. temperature
Temperature: 22°C → MultiCONT actual temperature
Temp max.: 35°C → MultiCONT max. temperature

5.4.12. Prog CS

When exiting the menu the device prepares a Frame Check Sequence from the settings (EXCLUSIVE-OR relation of bytes)




Main menu 05
Devices
Relays
Current outs
"OK"
Devices 06
01: ST300
02: SE300
03: SG300
Device selection with ⇧ and ⇩ buttons, then press OK to query and modify parameters.
Device is active
Device is not active, but can be programmed as if it were active
"OK"
Device: SG300 07
Remote programming
Programming the device and querying parameters
see: chapter 5.6.
Short TAG
To query and modify the Short TAG
use ⇦ ⇨ ⇧ ⇩ and after press OK
Short address
Short address* (1...15), used during detection
will search for the device this address
Secret code* not need for modification
Modify with care, modification not recommended
Message
Arbitrary text assigned to the device
(usually related to operation, max 32 char)
Description
Arbitrary text assigned to the device
(usually related to the material, max 16 char)
Date:
Date assigned to the device
Final ass. number
Factory setting = 0
Factory ID
Factory ID, for NIVELCO devices = 151
Device type ID
Device type ID, see chapter 5.2.1.1
SW version
Software version of the transmitter (see manual)
HW version
Hardware version of the transmitter (see amnual)
Device ID
Manufacturer's electronic serial number
Major revision
Factory setting = 0
Device revision
Factory setting = 0

* The configuration parameter of the „short address" and „secret code" differs for each device (See installation and programming manual of the given device).

5.6. REMOTE PROGRAMMING

Select the device to be programmed as described above.

Devices 06
01: ST300
02: SE300
03: SG300
"OK"
Device: SG300 07
Remote programming
Short TAG
Short address
"OK"
"OK"
The device is in PROG mode, remote programming is not allowed.
Quit programming mode or wait for automatic exiting of PROG mode (max. 30 min)
HART protection Press OK
"OK"
Remote programming 08
Secret unlock
Secret mod.
App. parameters
Parameters
Linear table
Echo
Clear TOT1
Clear TOT2
Factory defaults
"key" shows that the device configuration is protected by a "Password" (see programming manual of the device)
Unlocking the "Password"
Entering or changeing the "Password". To change an existing code the old one should be unlocked! *
Parameter for NIVELCO instruments for selecting the unit to be used (Metric: m, cm, US: ft, inch)
Querying and modifying the parameters of the device. **
If the device is password protected parameters are only readable. *
Editing the linearisation table (see chapter 5.6.1.)
Draws the Echo-map for ultrasonic transmitters***.
(returns with "unknown DEV/comm" error for devices whose this is not defined)
Clears TOT1 for with flow measurement function devices
Clears TOT2 for with flow measurement function devices
(only if sevice code of the device is known)
Return to default settings.

* ** *** See next page for explanation

* If the access is denied the following message appears.

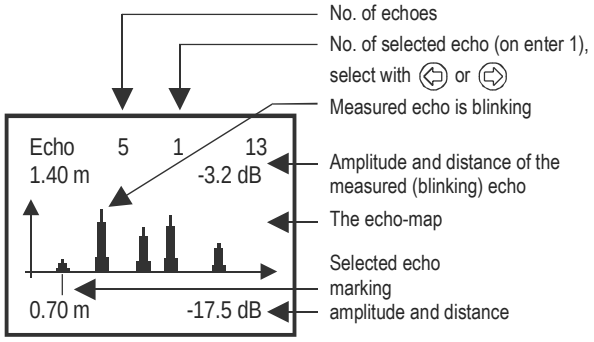
After entering a valid code press OK.

** Parameters entered during remote programming via MultiCONT will be sent without being checked to the device where the data is checked.in the event of bad parameter value, or if the given parameter is not defined in the given device, then the following message appears:

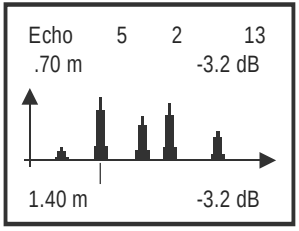
To correct the problem see the User's Manual of the respective device (transmitter)

*** Explanation of the Echo Map of ultrasonic transmitters

On enter:

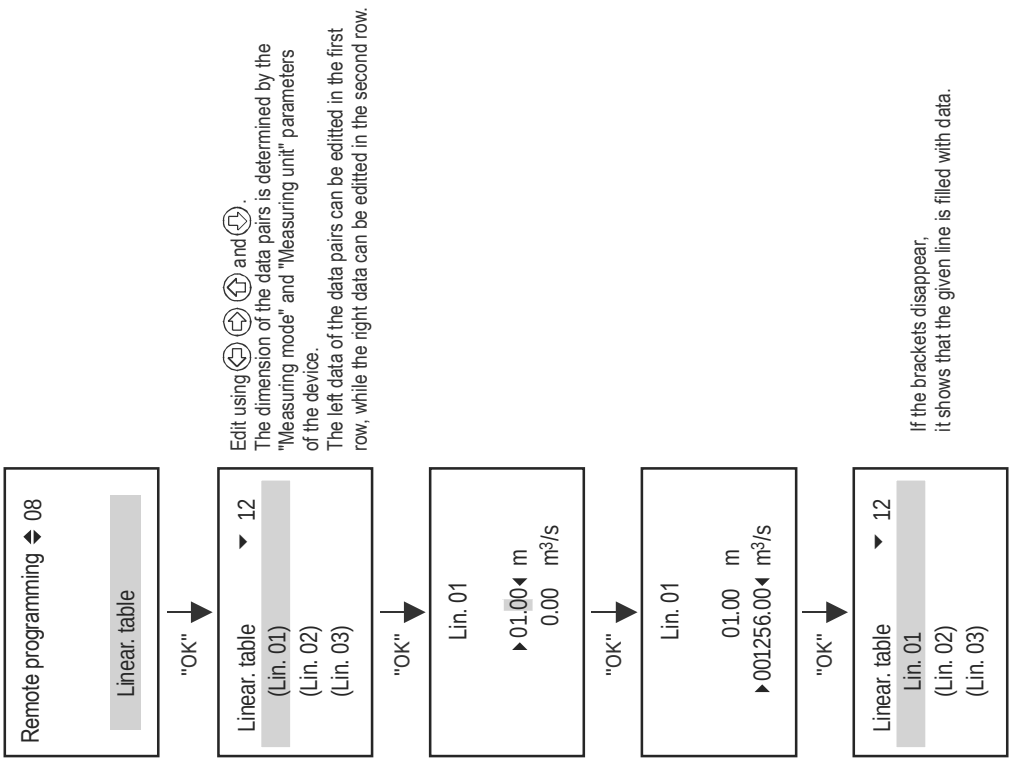

No. of echoes
No. of selected echo (on enter 1),
select with or
Measured echo is blinking
Echo 5 1 13
1.40 m -3.2 dB
Amplitude and distance of the measured (blinking) echo
The echo-map
Selected echo marking amplitude and distance
0.70 m -17.5 dB

after pressing button



Note: the displayed data are at the moment of entry into the menu.
The flashing echo is the one used by the transmitter to measure distance. To refresh the display press ESC then OK.

5.6.1. Editing the linearisation table


Remote programming 08
Linear. table
"OK"
Linear. table 12
(Lin. 01)
(Lin. 02)
(Lin. 03)
Edit using and .
The dimension of the data pairs is determined by the "Measuring mode" and "Measuring unit" parameters of the device.
The left data of the data pairs can be editted in the first row, while the right data can be editted in the second row.
"OK"
Lin. 01
01.00 m
0.00 m³/s
"OK"
Lin. 01
01.00 m
001256.00 m³/s
"OK"
Linear. table 12
Lin. 01
(Lin. 02)
(Lin. 03)
If the brackets disappear,
it shows that the given line is filled with data.

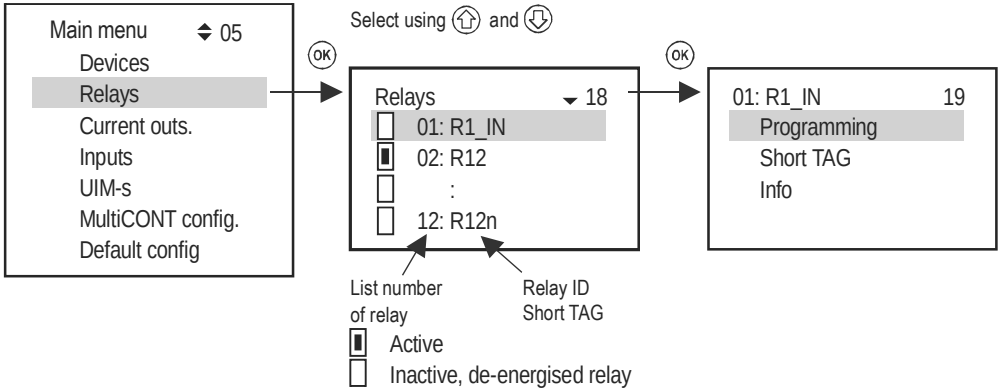
Warning! For the transmitter to compute the measurement results using the linearisation table, linearisation has to be enabled in parameter P47 (See the Installation and Programming Manual of the given transmitter)

5.7. RELAY CONFIGURATION

First of all it is recommended to decide which relay is to be assigned to which device(s), and to which measured value (PV=primary value, SV=secondary value, ….) in Main menu/Relays/ Program/Source. Relays can be assigned to one or more sources (difference, average). Secondly the relay function should be selected in Main menu/Relays/ Program/Function. Finally the parameters have to be specified in Main menu/Relays/Program/Parameter such that the dimensions of RP1 and RP2 are determined by the devices assigned to them. Thus if the chosen value is LEVEL [m] then the RPx parameters also have to be entered in LEVEL [m]. For overview see Menu system of the MultiCONT Attachment 3. The relay functions in detail are as below (default cursive in gray background).

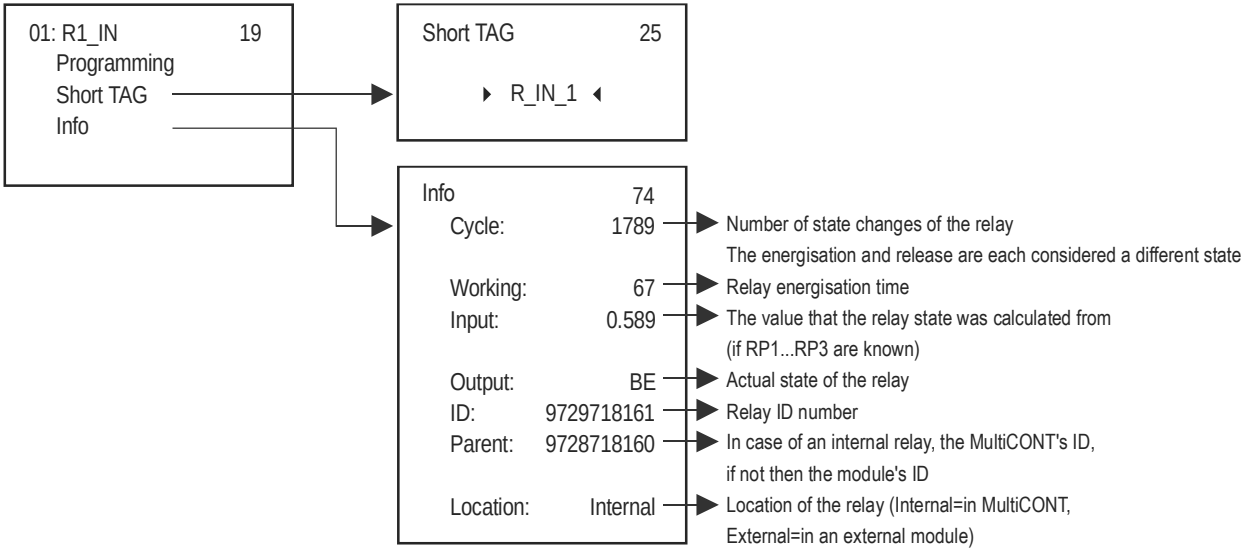
5.7.1. Relay Selection

It is impossible to enter the relay menu if the system does not contain a single relay. The number of relays in the system can be viewed under Main menu/MultiCONT config/ Report. (See chapter 5.4.9)



5.7.2. Properties of the selected relay

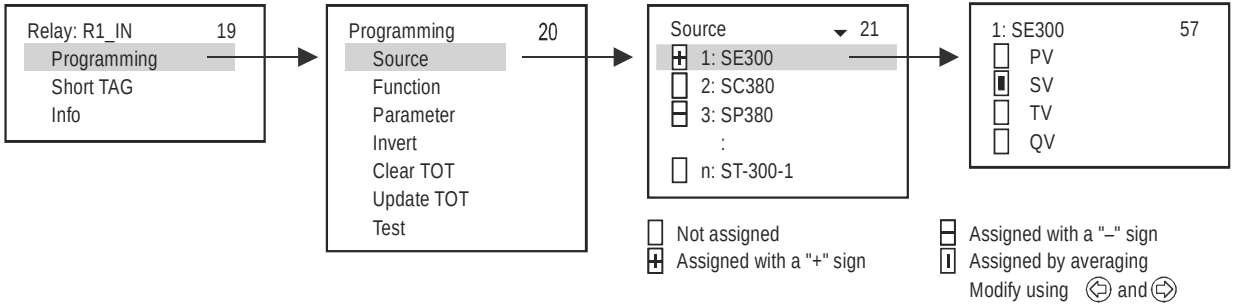
The refreshing of “Cycle”, “Work hours”, “Input” and “Output” takes place continuously in the case of the internal relays.



5.7.3. Relay programming

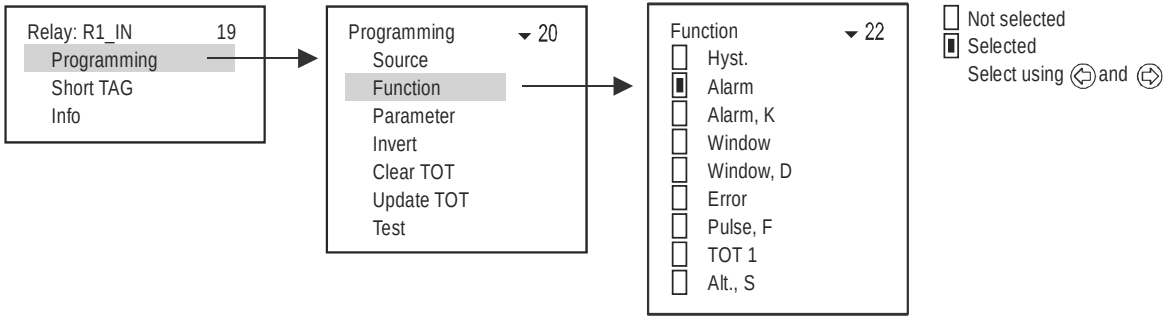
5.7.3.1 Source selection

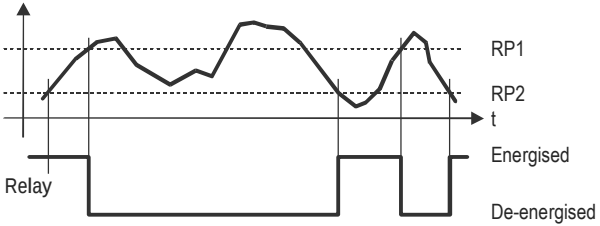
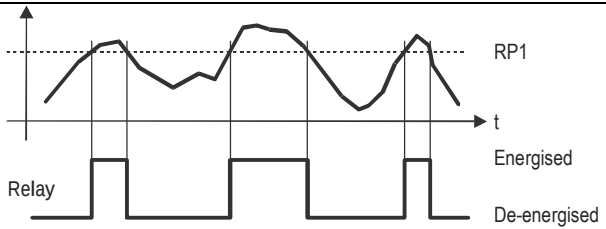
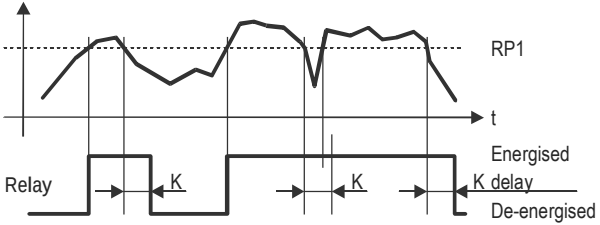
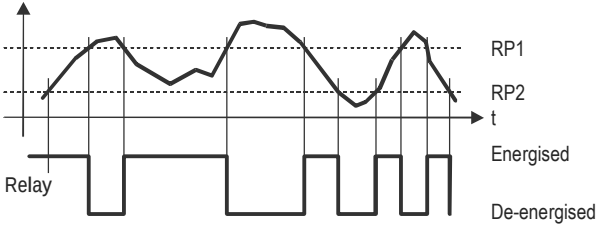
One or more devices can be assigned to one relay.

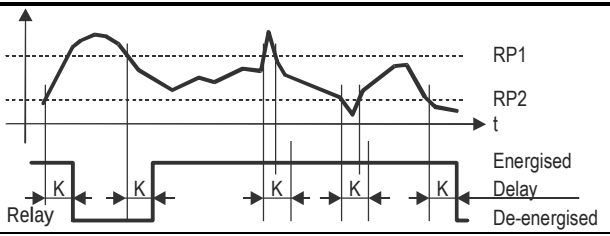
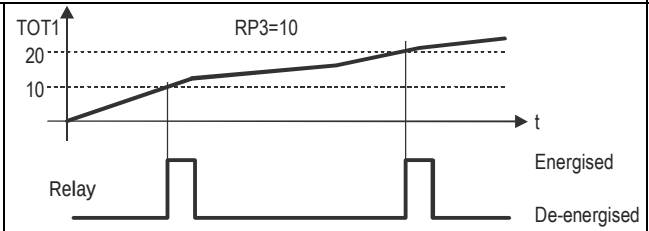
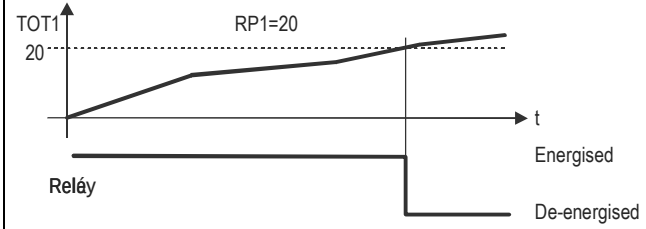


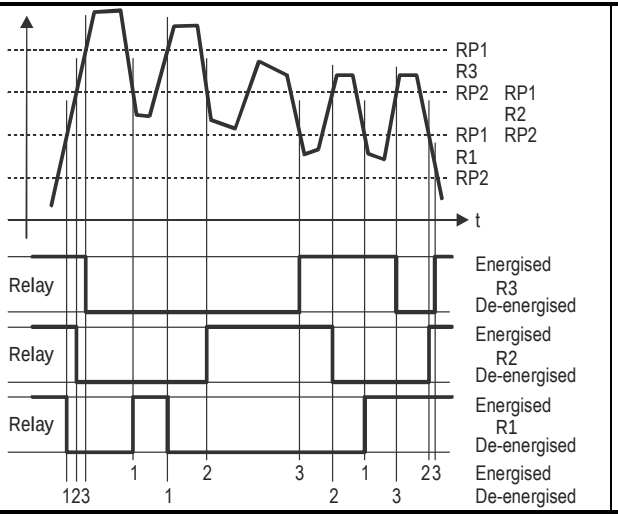
In the above example, Relay R1_IN is controlled by the difference between the secondary values of SE300 and SP380. In the case of a single unit, the sign is indifferent, in fact, average might as well be selected. In the case of the selection of multiple devices, control depends on the result of the mathematical sum. If in the case of selected multiple devices the dimensions of the quantities are different, the unit will display an error message. Upon selelcting the quantity, confirm that the appropriate HART command has been seleceted for the device (See Main menu/MultiCONT config/HART / command set, see chapter 5.4.5.5)

5.7.3.2 Function

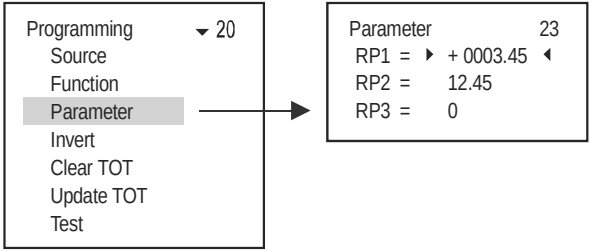


OPERATING MODE	FUNCTION	PROG. PAR
Hysterisis. (2-point control) *Default: filling with energized relay:* *Inversion = OFF,* *above RP1 the relay will be de-energized below RP2 it will be energized* Inverted operation: by interchanging RP1 and RP2 or by selecting Inversion = ON Main menu/Relays/Program/Invert If RP1 = RP2 then the upper alarm function is enabled		RP1, RP2
Alarm *Default: Inversion = OFF* *Below RP1 relay will be de-energized* Inverted operation (relay will be energized below RP1) or by selecting Inversion = ON Hysterisis = 2.5% of RP1 If RP1 = 0 the relay will be constantly energized		RP1
Alarm K (with delayed switching) *Default: Inversion = OFF* *below RP1 relay will be de-energized using delay in RP3 (Factory default t= 0 sec)* Delay can be set under RP3 in sec		RP1, RP3
Window (window comparator) *Default: Inversio n= OFF* *Between RP1 and RP2 relay will be energized* Inverted operation (*Between RP1 and RP2* relay will be de-energized) ...or by selecting Inversion = ON		RP1, RP2

Window D (comparator with delayed switching) *Default*: *Inversion = OFF* *Between RP1and RP2 relay will be energized using delay in RP3* *(Factory default t= 0 sec)* Inverted operation (*Between RP1and RP2* relay will be de-energized) …or by selecting Inversion = ON		RP1, RP2, RP3
Error *Default*: *Inversion = OFF* *In case of error relay will be de-energized. RP3=0 for any error; RP3=n for error of code* ***n*** Inverted operation (in case of error relay will be energized) or by selecting Inversion =ON		RP3
Impulse F *Default*: *Inversion = OFF* *relay will be energized for appr. 200ms for each unit volume set in RP3* Operation can be inverted by selecting Inversion = ON Programming error will be displayed if: – more than one device (transmitter) is marked as source …- RP3 = 0		RP3
TOT1 *Default: Inversion = OFF* *relay will be de-energized when TOT1 reaches value in RP1* Operation can be inverted by selecting Inversion = ON (relay will be energized)		RP1

Alt (optimized pump control) *Default*: *Inversion = OFF* More relays (max 8) can be assigned to one source (transmitter) and they are controlled such that the switching number will be the same for all of them. In this case the connected relays will be energized and de-energized one after the other irrespective of which relay's conditions are fulfilled. As in the diagram, relays programmed in this manner operate in the following sequence for: Mode:Alt S 1 23 1 23 Energised 123 1 2 3 De-energised Mode: Hysterisis 3 32 2 21 Energised 123 3 2 2 De-energised		RP1, RP2

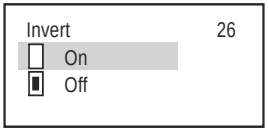
5.7.3.3 Configuring parameters



- ▸ ◂ Parameter to be edited
- Selection of digit position
- Modifying sign and number
- ESC For RP1 steps back to "Programming" sub-menu, for RP2 and RP3 steps back to the previous parameter
- OK Accepts parameter change and steps to the next, pressing for RP3, values of RP1...RP3 are loaded to the memory and steps back to "Programming" sub-menu

5.7.3.4 Inversion

The operation of the relay can be inverted by switching on the inverter.
Default: Off



Not selected
Selected
Select using ⇦ and ⇨
Selected choice gets applied immediately

5.7.3.5 Deleting TOT

Quantity (TOT1 and TOT2) summation is done in the flow-measuring transmitters. In the MultiCONT it is possible to transmit the TOT2 in preset units in the form of relay impulses .In order to do this, the relay has to be switched to 'Impulse F' mode. In the 'RP3' parameter (belonging to the relay), specify the volume that will trigger 1 impulse (the length of 1 impulse is about 200 ms). There is a 'PULSE' and a 'TOTAL' variable for each relay programmed to work in 'Impulse F' mode. The 'TOTAL' variable of the relay goes after the 'TOT2' variable of the transmitter. The volume difference between the 2 variables, given in 'RP3' is put into the 'PULSE' variable. The value in the 'PULSE' variable is transmitted to the output of the relay. The 'TOTAL' and 'PULSE' relay variables get into the "non-forgetting" memory even in the event of a power failure, as a result of the (automatic) saving done every 6 minutes.The relay impulses that occur in the time lapse between the last save and the return of power get counted again after the power supply is put on. In order to avoid repeated counting, use a UPS.

Example: Let the TOT2 value of the transmitter be 1000m^3. Let the TOTAL value of the relay also be 1000m^3. Let the PULSE value of the relay be 0. At the same time, assume the RP3 parameter of the relay to be 10m^3. In this case, no impulses appear at the relay output, because the TOT2 value of the transmitter is the same as the TOTAL value of the relay. Based on the measurement of the transmitter the TOT2 value changes from 1000m^3 to 1050m^3, the change being 50m^3. Also, based on the RP3 parameter of the relay (10m^3 unit volume), 5 is added to the value of the PULSE variable, with the change being 5*10=50m^3. The relay then counts 5 impulses. After this, the value of the relay's PULSE becomes 0, while that of TOTAL becomes 1050m^3

Once in this menu, pressing 'OK' will delete the values of the relay's 'TOTAL' and 'PULSE' variables. This results in the total volume in the transmitter's 'TOT2' variable to be counted to the output of the relay based on the unit set in the 'RP3'.

The delete operation is followed by the window below:.

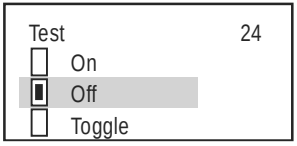
5.7.3.6 Refreshing TOT

Once in the menu, pressing 'OK' will copy the transmitter's 'TOT2' value into the relay's 'TOTAL' variable, and then delete the contents of the relay's 'PULSE'. The transmitter and the MultiCONT become synchronised

The update operation is followed by the window below.

5.7.3.7 Testing

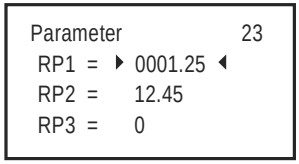
Relay operation can be tested as seen below.



☐ Not selected
▮ Selected
Select using ⇦ and ⇨
Changing the selection will change the state of relay immediately

In "toggle" mode, pressing ⇦ or ⇨ causes the state of the relay to switch.

Note:

1.


To program the parameter select the relevant parameter in Main menu/Relays/Relay/Program/Parameter using the ↑↓ buttons, enter the value in between the pointers and click OK. Programming can only be completed by clicking OK after setting RP3 (even if it is zero or not applicable in the given function!)

2. Inactive relays are de-energized (See: Main menu/Relays).
3. More than one device can be assigned to any of the relays (Main menu/Relays/Program/Source)
   The result will be the mathematical combination of the sources.
   If the measurement mode or dimensions of devices are different MultiCONT will send error message Program (See 6. Errors, Error messages)
   The result of the transmitters marked with ⊞ are added.
   The result of the transmitters marked with ⊟ is deducted from the sum of the result of the transmitters marked with ⊞
   Computes the average of the results of the transmitters marked with Ⅰ
   The instrument indicates error if the dimension or the measurement mode of the transmitters are different.
4. If the Error function is selected no (source) assignment is required since errors of all active devices will be monitored.
5. Relay state will not be changed (HOLD) if its assigned source does not reply!
6. The device will indicate program error if:
   - There are multiple sources with different dimensions
   - „Impulse F" function is selected, and there are multiple sources or RP3=0
   - „Alt S" function is selected, and more than 8 relays are assigned to one device or the sources are different (e.g.: PV for 1 relay, and SV for another)
   - The sources are ST, TV, and QV but the COM3 command is not selected

For a detailed overview of the Programming see Appendix 3.

5.8. OPERATION AND PARAMETERS OF CURRENT OUTPUTS

First of all a device should be assigned to the current output, (Main menu / Current outputs / Program / Source).

The result of the transmitters marked with ⊞ are added.

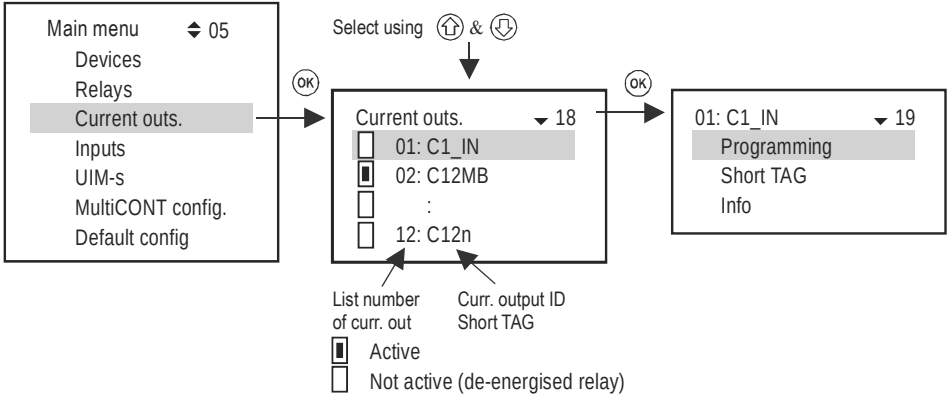
The result of the transmitters marked with ⊟ is deducted from the sum of the result of the transmitters marked with ⊞. (difference measurement)

Computes the average of the results of the transmitters marked with |

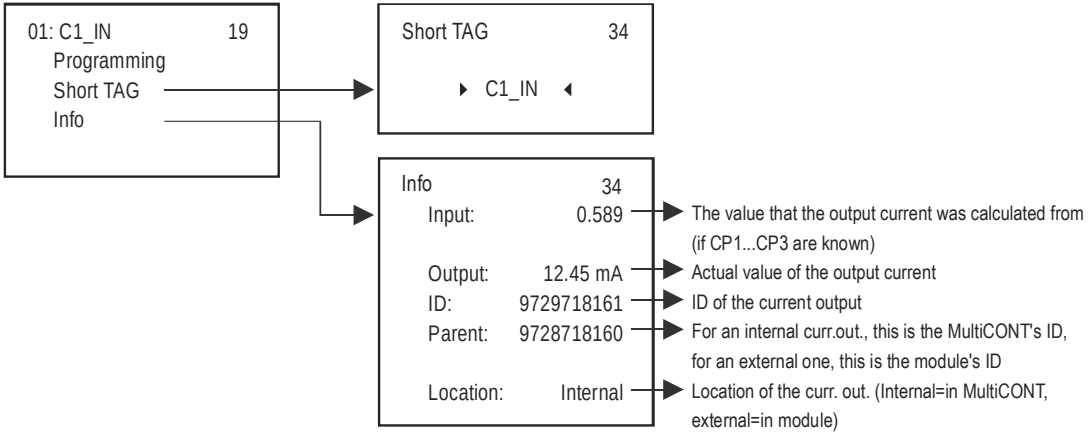
Secondly the relevant function should be selected and configured in Main menu/ Current outputs /Program/Function**.** Finally the parameters have to be programmed such that the values of the dimensions of CP1 and CP2 be determined by the transmitter(s). Thus if the measurement mode is LEVEL [m] (e.g. for SE-300 P01=x1 P00=00x), then the programming has to be in LEVEL [m] too (Main menu/ Current outputs /Program/Parameter).
For a detailed overview of the programming steps see Appendix 4.

5.8.1. Selection of Current outputs

It is impossible to enter the current output menu if the system does not contain a single current output. The number of relays in the system can be viewed under Main menu/MultiCONT config/ Report. (See chapter 5.4.9)



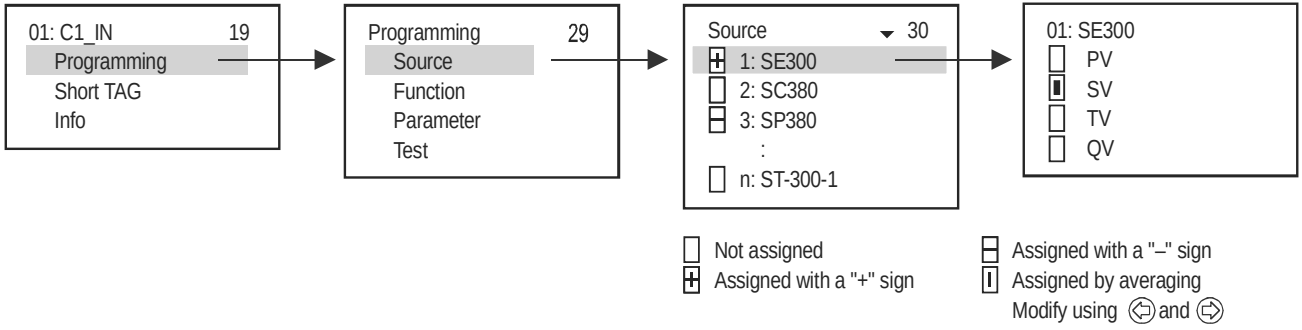
5.8.2. Properties of the selected Current Output


01: C1_IN 19
Programming
Short TAG
Info
Short TAG 34
C1_IN
Info 34
Input: 0.589
Output: 12.45 mA
ID: 9729718161
Parent: 9728718160
Location: Internal
The value that the output current was calculated from (if CP1...CP3 are known)
Actual value of the output current
ID of the current output
For an internal curr.out., this is the MultiCONT's ID, for an external one, this is the module's ID
Location of the curr. out. (Internal=in MultiCONT, external=in module)

5.8.3. Current Output programming

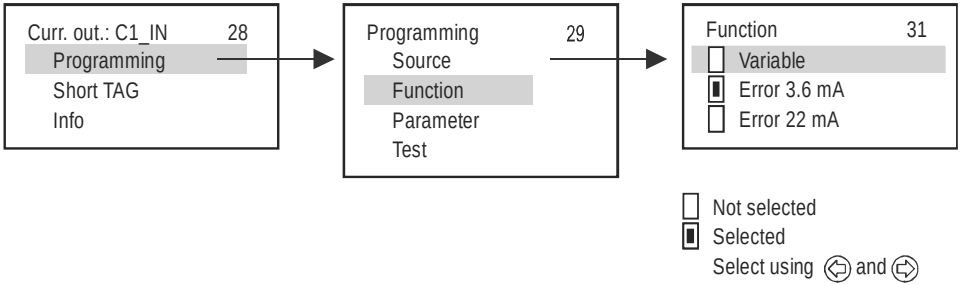
5.8.3.1 Source selection

One or more devices can be assigned to a single current output



In the above example, current output C1_IN is controlled by the difference between the secondary values of SE300 and SP380. In the case of a single unit, the sign is indifferent; in fact, average might as well be selected. In the case of the selection of multiple devices, functioning depends on the result of the mathematical sum. If in the case of selected multiple devices the dimensions or the values are different, the unit will display an error message. Upon selecting the value, confirm that the appropriate HART command has been seleceted for the device (See Main menu/MultiCONT config/HART / command set, see chapter 5.4.5.5)

5.8.3.2 Function

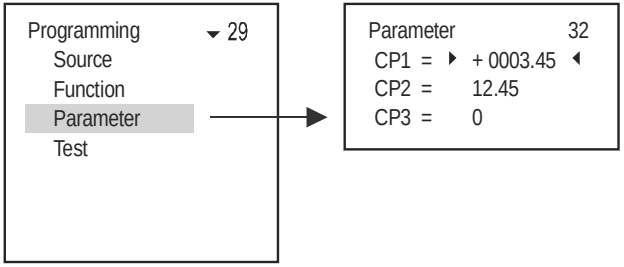


FUNCTION	DESCRIPTION OF OPERATION	PROG.PAR.
Value	Operates according to the value selected in the „Source" menu item (DIS, LEV, VOL, FLOW) 4 mA belongs to the value of parameter CP1, while 20mA belongs to that of parameter CP2.	CP1,CP2
Error 3.6mA	CP3=0 error current for every error CP3=n error current for code „n" error For Error Codes (see chapter 6.) If there is no error, the value of the output current is 4mA	CP3
Error 22mA		

Remark:

1. The device will display an error if the selected mode is "variable" and CP1=CP2
2. Value of the output current will not change (HOLD), if the assigned device does not respond or or responds with an "Err xx" error!
3. If the current output is not active the output will be 0 mA.
4. If the Error function is selected, then no source assignment is required since errors of all active devices will be monitored.
5. The modified parameters can only be saved when the cursor is on CP3 by pressing OK.

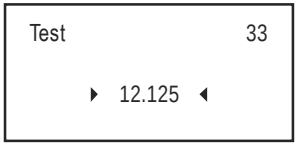
5.8.3.3 Parameter configuration



- ▸ ◂ Parameter to be edited
- Selection of digit position
- Sign and number modification
- (ESC) from CP1: steps back to "Programming" sub-menu, from CP2: and CP3 steps back to the previous parameter
- (OK) Accepts parameter change and steps to the next row. Pressing when CP3 is highlighted, loads the values of CP1...CP3 into the memory and steps back to "Programming" sub-menu

5.8.3.4 Testing

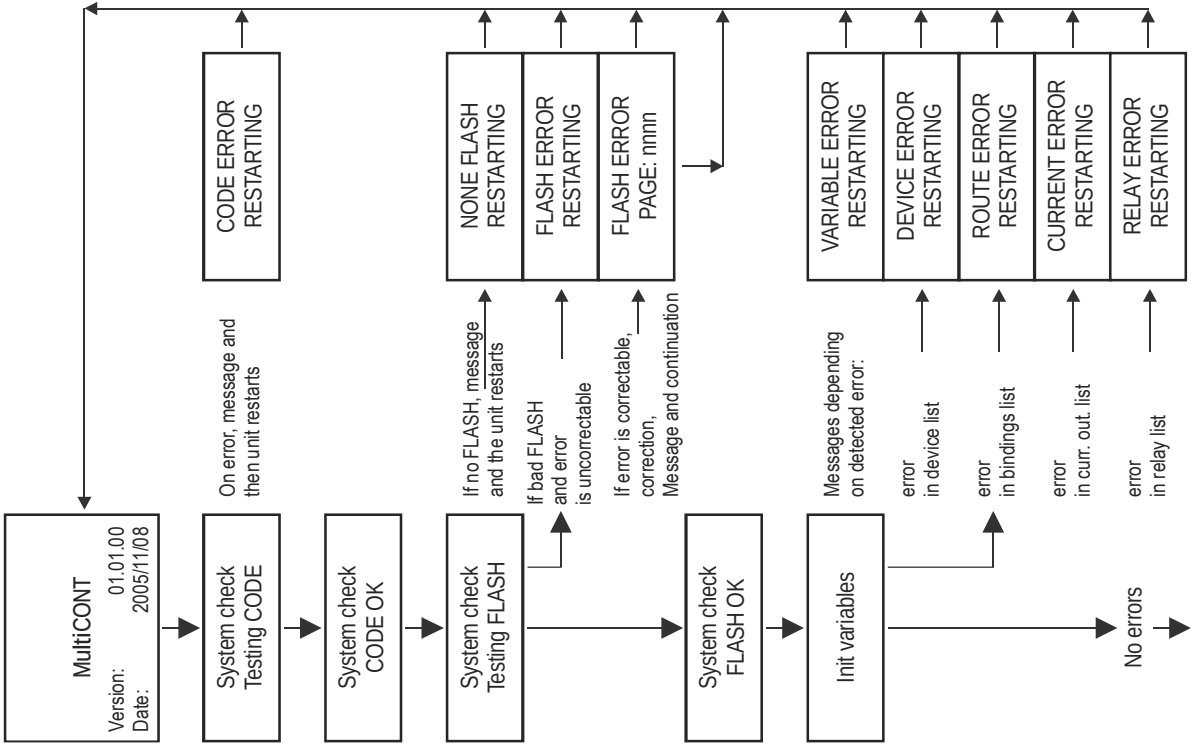
The current output can be tested in steps of 1µA. Upon changing the numbers, the output changes immediately, and it is not necessary to press OK.



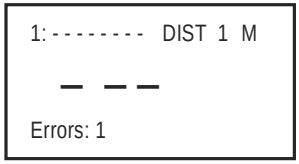
- Selecting the digit position
- Sign and number modification

5.9. THE BOOT PROCESS

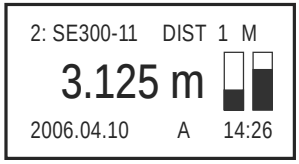
At every powering on a test program runs, testing the MultiCONT hardware The whole process can be followed on the display in English. The procedure takes about 50s. Pressing ESC will accelerate the test (to about 25 s).



In case of FLASH error the unit will restart repeatedly because the unit is faulty. Please send the unit back to the manufacturer.
A working unit will query the devices stored in the device list and enter measurement mode. After this, it will operate according to the settings configured in Main menu / MultiCONT config (chapter 5.4), See 5.10 Measurement Mode, Appendix 5)



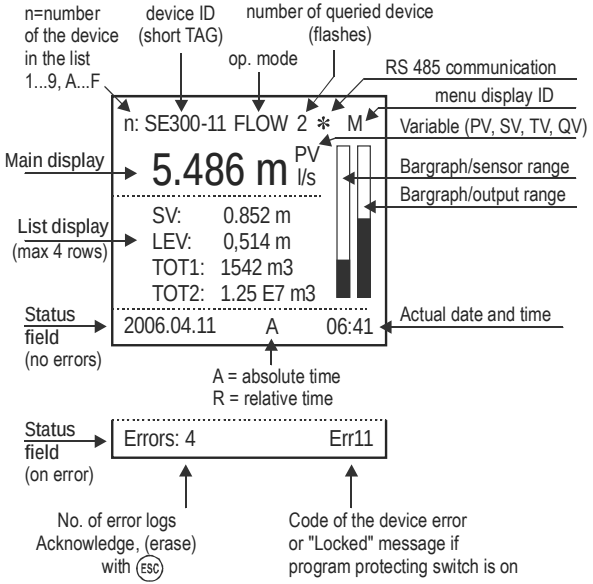
There is no response from device with List TAG 1. (there is no result to display)
Error “Reply” appears in the error list. (See 6. Error codes)



The result of the device with List TAG 2. is on the display.
Device with List TAG 1. is being querried. (See 5.10 Measurement mode)

5.10. MEASUREMENT MODES

After the boot test the MultiCONT will automatically enter the Measurement Mode / standard display image. Measurement values will be queried and displayed in accordance with the contents of the device list read from the memory and the settings in Main menu / MultiCONT config. / Display mode. Maximum 5 data per device can be displayed simultaneously on the display (1 main image – see 5.5.3 - and 4 on the list image – see 5.4.4) together with dimensions and abbreviations (DIST, LEV, VOL, FLOW, PV, SV, TV, QV, TOT1, TOT2, E). In the upper row we can see the device identifier (Short TAG), List Tag (1,...9,A.,...F) and the device actually communicating with the MultiCONT.
When the device communicates via RS485, the „*"flashes. There are two bargraphs on the display. One is the „sensor range" (only for Nivelco transmitters), and this constitutes the transmitter's measurement range (the tank level between the maximum and minimum measuring distance). The other is the „output range" that constitutes the 4-20mA range of the transmitter.


n=number of the device in the list 1...9, A...F
device ID (short TAG)
number of queried device (flashes)
op. mode
RS 485 communication
menu display ID
n: SE300-11 FLOW 2 * M
Variable (PV, SV, TV, QV)
Main display
5.486 m
PV l/s
Bargraph/sensor range
Bargraph/output range
List display (max 4 rows)
SV: 0.852 m
LEV: 0,514 m
TOT1: 1542 m3
TOT2: 1.25 E7 m3
Status field (no errors)
2006.04.11 A 06:41
Actual date and time
A = absolute time
R = relative time
Status field (on error)
Errors: 4
Err11
No. of error logs Acknowledge, (erase) with ESC
Code of the device error or "Locked" message if program protecting switch is on

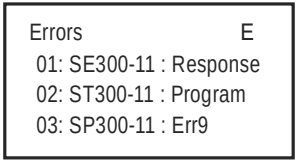
In this mode, it is possible to view the „Bargraph display", the „User display" (Range, Double, Difference, Average see Mainmenu / MultiCONT config / user's image - chapter 5.4) selected by the user, the relay-device and current output-device assignments, and also the error list, using ⇦ and ⇨ for selection. See Appendix 5

After the termination of a possible error, the display keeps on displaying the error until the error is acknowledged by pressing the ESC button. The query of the devices, the control of the relays and the current outputs and the servicing of the RS485 all happen continuously during programming. The MultiCONT automatically returns to measurement mode 5 minutes after the last button was pressed. It also records and saves the number of switchings and worktime of the relays every 6 minutes. The 6 minutes commence after the automatic exit.

6. ERROR CODES

In the event of an error, the felirat “errors” (see Measurement mode, appendix 5) immediately appears irrespective of which device the error is connected to.

Errors occurring during operation will be collected in the E (Error) table where the error identifier message can be viewed.



“Sensor” and “Reply” error message swill automatically erased from the list upon termination of the error.

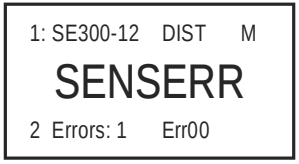
Other errors entries will remain in the table until acknowledgement by pressing ESC. Thus for instance if a relay or current generator set for function “Error”, it will indicate the error even after termination of the error until the error is acknowledged as above.

ERROR CODE	MESSAGE	ERROR DESCRIPTION	CORRECTION
1	Init	Device does not reply after switching-on*	Check wiring of device
2	Reply	Device with normal operation does not respond **	Check wiring of device
3	Sensor	Sensor failure on the device ***	Check device (transmitter)
4	Device	Other device Error (See chart next page)	Check programming of device (See relevant Install and Prog. Manual), and measurement conditions
5	Program	Error occurred during programming of relay or current generator ****	Check programming
6	Save	Error occurred in the course of saving to memory	If this happens repeatedly,send device to the manufacturer.

* An active device on the list does not reply after switching-on. Possible reasons:
- the system was modified before switching on (device was disconnected, the wiring changed, etc.)
- device failed to reach operation conditions during the boot process (and is not yet able to measure) thus this error message appears (e.g. in solid applications, STD-300 transmitters may not respond until the amplification reaches operation conditions).

** A device that had been working perfectly suddenly stops responding. Possible reasons:
- the device has become bad
- broken cable
- noisy HART line (See Main menu/MultiCONT config/HART test)

*** A special error message belongs to sensor faults. This error can appear in the case of ultrasonic transmitters due to the breakdown of the transducer or during a dusty filling process, when if there is a display, a NoEcho message is displayed. In the case of magnetostrictive transmitters, this error can be due to the cracking of the magnet disc, or a break in the magnetostrictive wire.

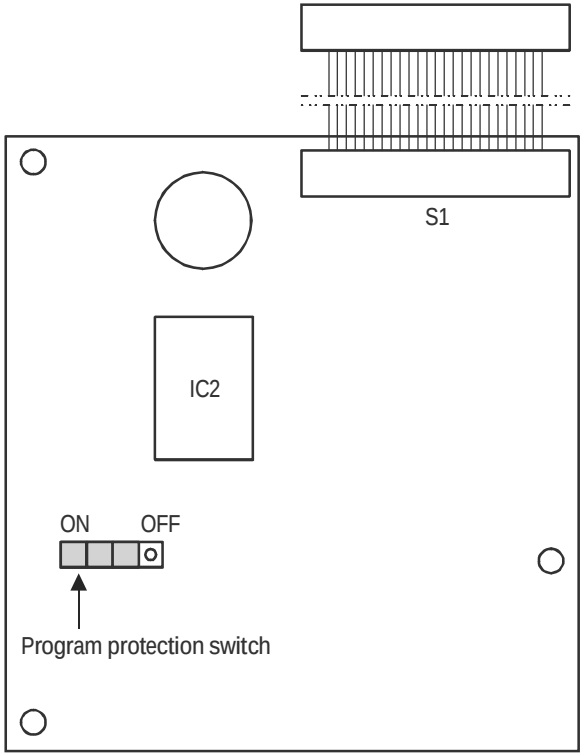


Device responds but there is no valid result because of sensor error.

**** Programming error will be caused:

- assignment of more than one source with different dimensions to a relay or current output
- An appropriate value (PV, SV, etc) is assigned to a current output and CP1=CP2 (see 5.8 Operation and parameters of current outputs)
- assignment of flow value (Impulse F) to a relay and there is more than one source (see 5.7 Relay configuration)
- assignment of flow value (Impulse F) to a relay and RP3=0 (see 5.7 Relay configuration)
- more than 8 relays with „Alt S" function are assigned to to a transmitter
- different variables are selected in the case of a relay with „Alt R" function
- The source is SV, TV or QV, but the COM3 HART command is not selected.

7. HARDWARE PROTECTION OF SETTINGS



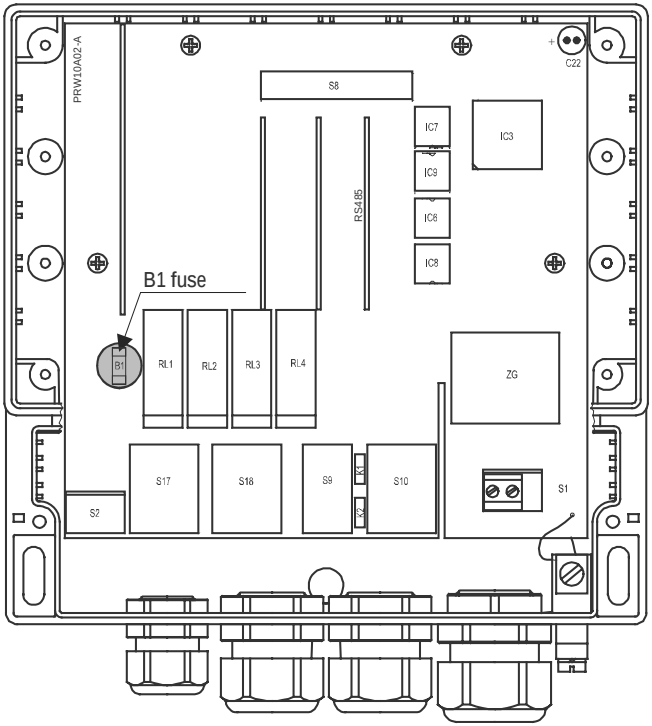
For access, loosen the nuts fastening the front panel.

The program protection switch in its ON position will prevent modification of parameters affecting operation such as:

- relay parameters
- current output parameters
- activation of devices
- remote programming
- denying access to the Service menu
- denying permission to run DEV detect, EXT detect under MultiCONT config

The switch does not prevent modifications that do not influence the operation of the MultiCONT (such as language, backlight, user image, etc)

8. FUSE REPLACEMENT



In order to change the fuse loosen four nuts fastening the front panel, carefully tilt the front panel forward, such that the cable band is not under tension and replace the fuse.

Warning! Only use fuses specified in the table below:

POWER SUPPLY	FUSE B1
85…255 V AC 50…60Hz	T400mA
11,4…28 V AC 50…60Hz 11,4…40 V DC	T1A

The device contains 1 network fuse. Its value depends on the power supply.

9. SERVICING

9.1. BOX MESSAGES:

No.	Box Message	Explanation
1	No CODE!	Secret code is not set
2	In manual prg!	The transmitter is under manual programming
4	Alredy unlocked!	No code in the trasnmitter (i.e. 00000000)
5	Unlock, please!	Secret code needed for modification (see."Main menu/"MultiCONT config."/"password")
6	HART error!	Communication error
7	TOT1 cleared!	Value of TOT1 deleted
8	TOT2 cleared!	Value of TOT2 deleted
9	HART no reply	During programming the device does not respond, or bad data
10*	HART comm. error	Error in HART message (parity, framing, overflow, …)
11*	HART logical error	Other logical error in HART message
12*	HART write protect	The parameter cannot be written
13	Unknown dev/comm	The address (Long address) in the HART message is not found in the list
14	Parameter saved	Successful save of the parameter
15	Save error	Error in writing to FLASH memory
16	Device added	The selected device in the „Device detect" menu has been included into the list.
18	Unknown param.	Unknown parameter during device detection
19	Default loaded	Loading of Factory default (depending on type) was successful.
20	PSW cleared	Secret code is deleted
23	FLASH error	FLASH error at boot
24	Same address!	Multiple same Long address found during DEV detect
25	No HART device	In the „Device detect" menu, searched for devices with „Short addr." between 0..15 but did not find any
26	Load error	Error when reading from FLASH memory
28	No comp. Device	Device is not NIVELCO compatible
30	HART:Parse error	The received data are not applicable

No.	Box Message	Explanation
31	HART:Invalid sel.	The received HART command is unknown to the MultiCONT
32	HART:Too large	The received HART command is longer than standard
33	HART:Too small	The received HART command is shorter than standard
34	HART:Few data	
35	HART:Device spec.	Bad parameter sent during remote programming
36	HART:Acces restr.	
37	HART:Busy	
38	HART:Comm. not. imp.	The received HART command is unknown to the MultiCONT
39	Please wait!	DEV detect cannot run due to periodic disturbance on the HART line, which causes continuous error!
40	TOT cleared	TOT deleted during relay progamming (Impulse F)
41	TOT updated	TOT updated during relay progamming (Impulse F)
42	No in RP mode	Device could not enter „Remote programming" (RP) mode during programming
43	Stick in RP mode	Unsuccessful exit after remote programming of device

9.2. OTHER MESSAGES:

No.	Message	Explanation
1	Scanning HART line	Displayed during device detection
2	Logical error	- Displayed instead of user's image, if difference or average is selected, but there is only one active device - Displayed if the dimensions of the results of the selected devices are different
3	No user screen	In „Main menu"/"MultiCONT config."/"User display" „None" is selected
4	No active device	Displayed during measurement or instead of user's image, when there is no avtive device
5	No HART device	The unit's device list is empty (run „DEV detect"
6	Locked	The hardware switch is on (the program cannot be modified)
7	No current output	Displayed in the position of the „current output assignment" image, if there is no current output in the system
8	No relay output	Displayed in the position of the „Relay assignment" image, if there is no relay in the system

9.3. TROUBLESHOOTING

9.3.1. It is impossible to enter the „Main menu"/"Relays" or „Main menu"/„Current outputs" menu:

There is no relay or current output in the unit. Check the number of relays and/or current generators in „Main menu"/"Multicont config."/"report" menu.

9.3.2. It is impossible to enter the „Main menu"/"Devices" menu:

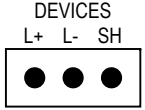
The device list is empty. (there are neither inactive, nor active devices in the system, in measurement mode a „No HART Device" message appears on the display.)

9.3.3. A „Please wait" message appears upon selecting „DEV detect"

The HART line is so noisy, that there is no communication, and every command is bad. The only way to exit this state is by putting the unit off and on again. Enter „Main menu"/"MultiCONT config.."/"HART"/"Debug"/"Listen" and check if the CD is „0". While it it continuously 1, communication between MultiCONT and the transmitters is not possible. Check the shielding of the cable and the cable route.

9.3.4. The result of „DEV detect" is the „No device" message

The MultiCONT did not detect any device that responded.



- If there are multiple devices in the loop, check for short-circuits or open-circuits.
  There is a short-circuit if there is voltage between L+ and SH, but between L+ and L- the voltage is 0.
- The line is open-circuited (cut) if there is no voltage between L- és SH, because there is no voltage drop on the sensing resistor (R_{fi}=255Ω) connected between these 2 points, whereas the loop current should never be 0.
- Check the terminal voltage at the devices (transmitters). If the terminal voltage is small, it might be due to bad wiring (big intermediate resistance) or big loop current, resulting on a big voltage drop on the sensing resistor. Connect the devices in to the loop one by one, checking the „Short address" and the constant current parameter (see: chapter on preparation of transmitters)
- Confirm that the device is HART capable (Type, nameplate)

9.3.5. The unit does not start up when switched on

It restarts repeatedly (see: chapter 5.9.)

- This can be due to bad FLASH (the non-volatile memory in the unit)
- Or a bad RS485 card (types P__-1_A and P__-1_B), because this is tested at boot, and does not continue in case of an error. Request help from our Export department.

9.3.6. The „Response" error entry is too frequent

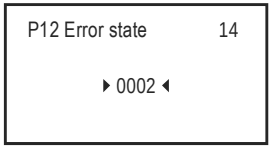
The line is noisy, check the grounding of the cable shielding. If the cable is not shielded, replace it with a shielded cable. The reliability of the communication can be checked under the „Main menu"/"MultiCONT config."/"Hart"/"Statistics" menu, where Tx is the number of transmitted requests,and Rx is the number of correct responses.

9.4. ADDITIONAL INFORMATION

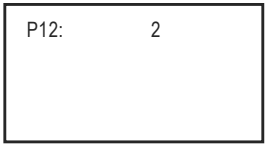
9.4.1. Problems that may occur during remote programming:

In the case of integer type parameters, Multicont displays all the four digits even if the case of a given transmitter only one digit is meaningful. For example:

PRW :



SE-300:



SE-300 only tests the value of digit „a" value(see Manual), and does not display an error if we write 1002-t. It even stores this value. It does not indicate any operational error, but upon reading this parameter from SE-300 we receive 1002 which does not have any meaning according to the manual!!!!

9.4.2. MultiCONT transmits the parameters without examining them, and the testing is done by the device.

In the event of an error, if the device does not accept it, then a "HART logical error" box message appears on the display.

9.4.3. Use of Second HART Master (Hand-Held or HART modem + Eview program)

Normally, there can only be one master in HART systems. Since the MultiCONT is a master, other masters can only be used if if the status of every device is set to inactive, i.e. the MultiCONT is in listen mode. (see „Main menu"/"devices") After this, the other master can be connected to the L- and SH terminals (with a 255 Ohm sensing resistor inside)

9.4.4. Upon exiting remote programming, the unit tests to see if the transmitter really exited the remote programming mode

(During remote programming „RP" appears on the display of the transmitter). If this is not successful, then the „Stuck in RP mode" box message keeps us informed. In this case, it is not possible to manually enter programming mode!!

9.4.5. When a transmitter does not respond, then „Response" error is entered into the table, but upon termination of the error (the device responds), this entry is automatically cleared from the table (and does not need to be acknowledged).

This is also true for „Szensor" error (noEcho, etc) The states of the relays and current outputs are not refreshed during this process!!!

9.4.6. Upon exiting the menu, MultiCONT immediately saves the modifications.

However, there are events that need to be saved, and this happens every 6 minutes. These include:

- Work time and number of state changes of relays
- The number of times the MultiCONT was switched on (see: „Main menu"/"MultiCONT config."/"Report"/"Power count")
- The relevant internal variables, if the function of any relay is „Impulse F", i.e. RP3 sends a unit pulse to the output, (TOTAL and PULSE, see: „Main menu"/"Relays"/"Programming"/"deleting TOT")

9.4.7. The error list is cleared when the device is put off

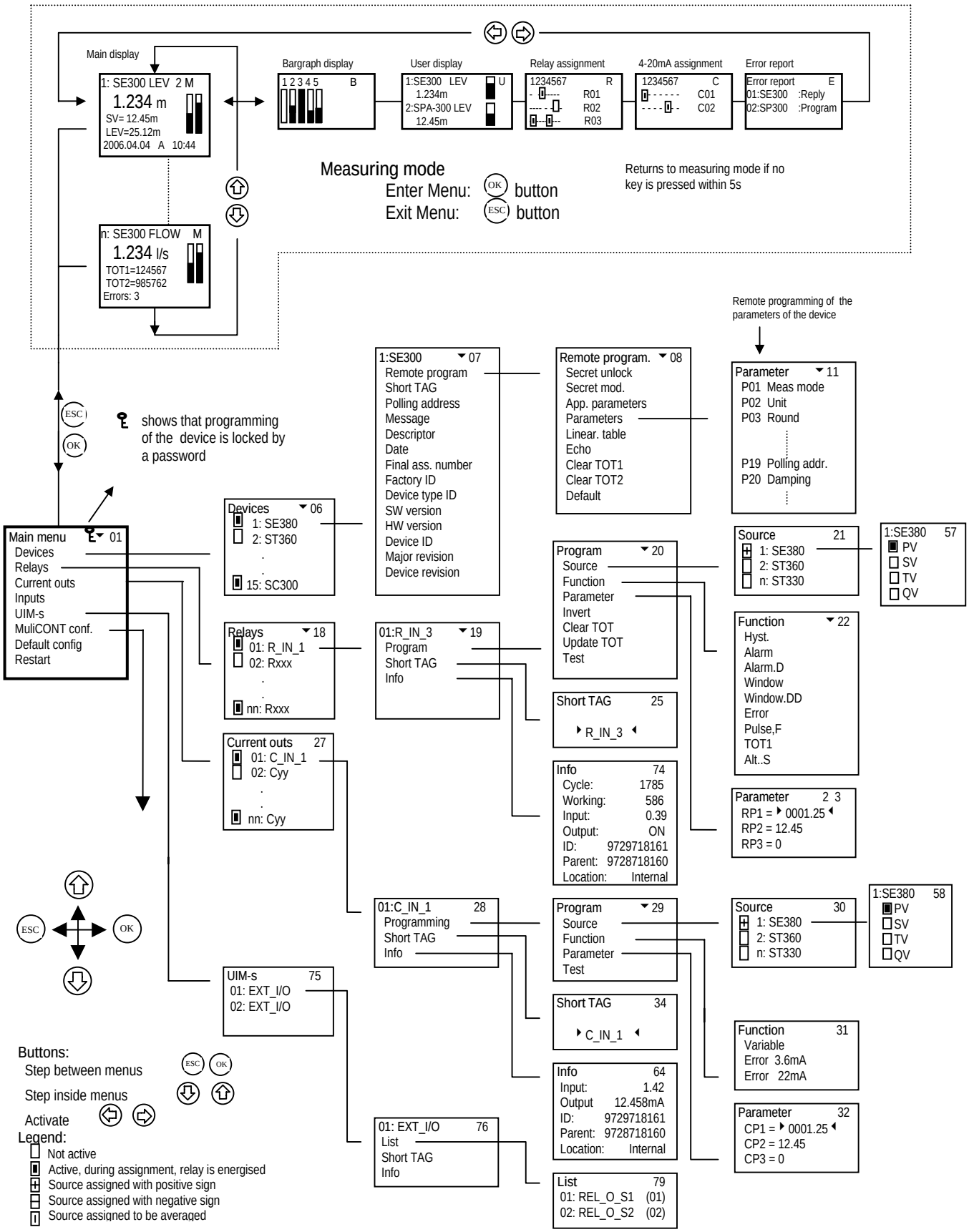
APPENDIX 1. MANUFACTURER IDENTIFICATION CODES OF HART-CAPABLE DEVICES:

1 "Acromag",
2 "Allen Bradley",
3 "Ametek",
4 "Analog Devices",
5 "Elsag Bailey",
6 "Beckman",
7 "Bell Microsensor",
8 "Bourns",
9 "Bristol Babcock",
10 "Brooks Instrument",
11 "Chessel",
12 "Combustion Engineering",
13 "Daniel Industries",
14 "Delta",
15 "Dieterich Standard",
16 "Dohrmann",
17 "Endress & Hauser",
18 "Elsag Bailey",
19 "Fisher Controls",
20 "Foxboro",
21 "Fuji",
22 "ABB Automation",
23 "Honeywell",
24 "ITT Barton",
25 "Kay Ray/Sensall",
26 "ABB Automation",
27 "Leeds & Northrup",
28 "Leslie",
29 "M-System Co.",
30 "Measurex",
31 "Micro Motion",
32 "Moore Industries",
33 "Moore Products",
34 "Ohkura Electric",
35 "Paine",
36 "Rochester Instrument Systems",
37 "Ronan",
38 "Rosemount",
39 "Peek Measurement",
40 "Schlumberger",
41 "Sensall",
42 "Siemens",
43 "Weed",
44 "Toshiba",
45 "Transmation",
46 "Rosemount Analytic",
47 "Metso Automation",
48 "Flowserve",
49 "Varec",
50 "Viatran",
51 "Delta/Weed",
52 "Westinghouse",
53 "Xomox",
54 "Yamatake",
55 "Yokogawa",
56 "Nuovo Pignone"
57 "Promac",
58 "Exac Corporation",
59 "Meggitt Mobrey",
60 "Arcom Control System",
61 "Princo",
62 "Smar",
63 "Foxboro Eckardt",
64 "Measurement Technology",
65 "Applied System Technologies",
66 "Samson",
67 "Sparling Instrumnets",
68 "Fireye",
69 "Krohne",
70 "Betz",
71 "Druck",
72 "SOR",
73 "Elcon Instruments",
74 "EMCO",
75 "Termiflex Corporation",
76 "VAF Instruments",
77 "Westlock Controls",
78 "Dexelbrook",
79 "Saab Tank Control",
80 "K-TEK",
81 "Flowdata",
82 "Draeger",
83 "Raytek",
84 "Siemens Milltronics PI",
85 "BTG",
86 "Magnetrol",
87 "Metso Automation",
88 "Milltronics",
89 "HELIOS",
90 "Anderson Instrument Company",
91 "INOR",
92 "ROBERTSHAW",
93 "PEPPERL+FUCHS",
94 "ACCUTECH",
95 "Flow Measurement",
96 "KAMSTRUP",
97 "Knick",
98 "VEGA",
99 "MTS Systems Corp.",
100 "Oval",
101 "Masoneilan-Dresser",
102 "BESTA",
103 "Ohmart",
104 "Harold Beck and Sons",
105 "Rittmeyer Instrumentation",
106 "Rossel Messtechnik",
107 "WIKA",
108 "Bopp & Reuther Heinrichs",
109 "PR Electronics",
110 "Jordan Controls",
111 "Valcom s.r.l.",
112 "US ELECTRIC MOTORS",
113 "Apparatebau Hundsbach",
114 "Dynisco",
115 "Spriano",
116 "Direct Measurement",
117 "Klay Instruments",
118 "Action Instruments",
119 "MMG Automatiky DTR",
120 "Buerkert Fluid Control Systems",
121 "AALIANT Process Mgt",
122 "POUNDS INSTRUMENT",
123 "ZAP S.A. Ostrow Wielkopolski",
124 "GLI",
125 "Fisher-Rosemount Performance Technologies",
126 "Paper Machine Components",
127 "LABOM",
128 "Danfoss",
129 "Turbo",
130 "TOKYO KEISO",
131 "SMC",
132 "Status Instruments",
133 "Huakong",
134 "Duon Systems",
135 "Vortek Instruments, LLC",
136 "AG Crosby",
137 "Action Instruments",
138 "Keystone Controls",
139 "Thermo Electric Co.",
140 "ISE-Magtech",
141 "Rueger",
142 "Mettler Toledo",
143 "Det-Tronics",
144 "TN Technologies",
145 "DeZURIK",
146 "Phase Dynamics",
147 "WELLTECH SHANGHAI",
148 "ENRAF",
149 "4tech ASA",
150 "Brand Instruments",
151 "NIVELCO",
152 "Camille Bauer",
153 "Metran",
154 "Milton Roy Co.",
155 "PMV",
156 "Turck",
157 "Panametrics",
158 "Stahl",
159 "Analytical Technology Inc.",
160 "Fieldbus International",
161 "BERTHOLD",
162 "InterCorr",
163 "China BRICONTE Co Ltd",
164 "Electron Machine",
165 "Sierra Instruments",
166 "Fluid Components Intl",

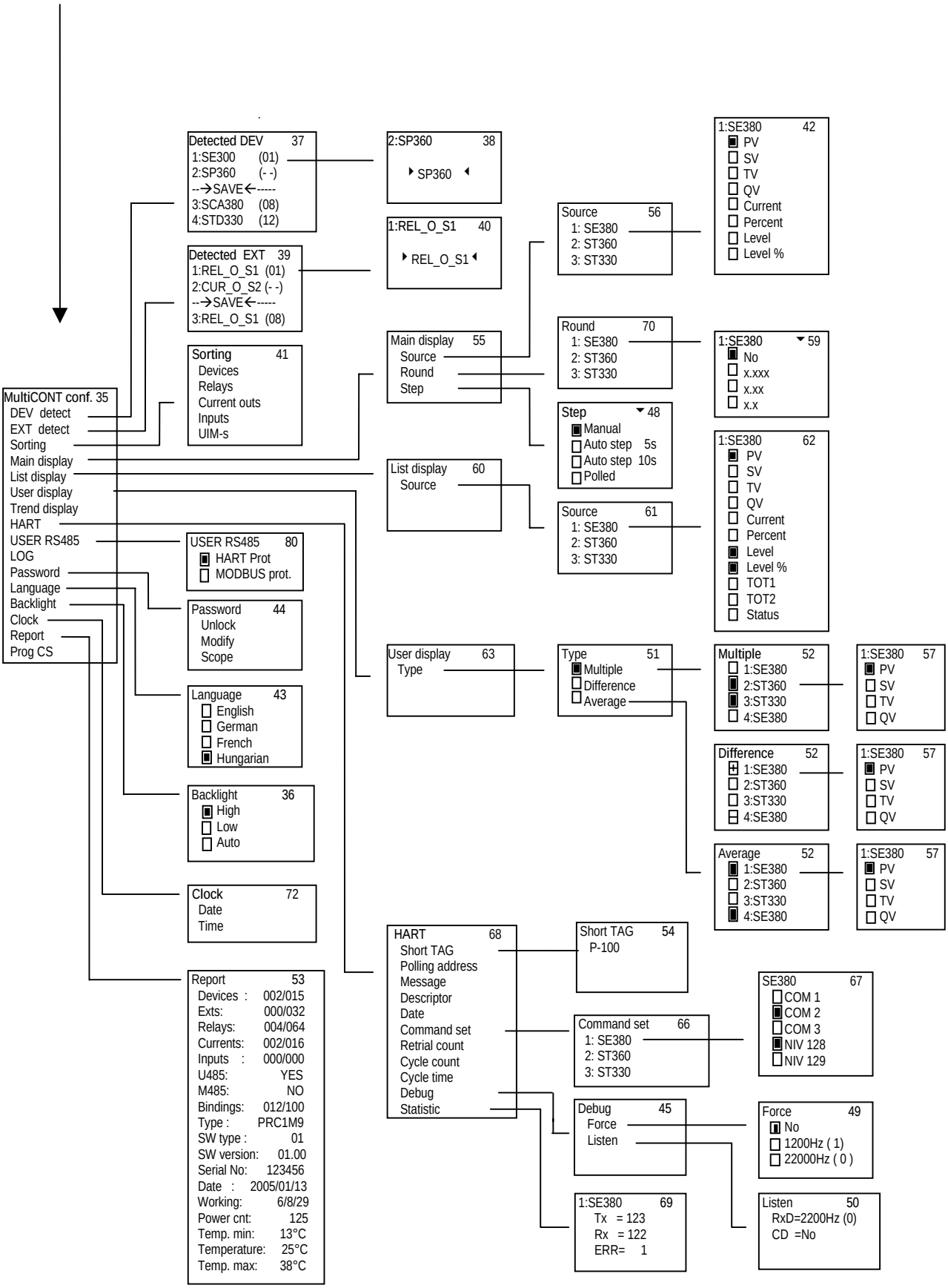
prw1101a0600p_03.doc
2007. november 28.

Nivelco reserves the right to change technical data without notice.

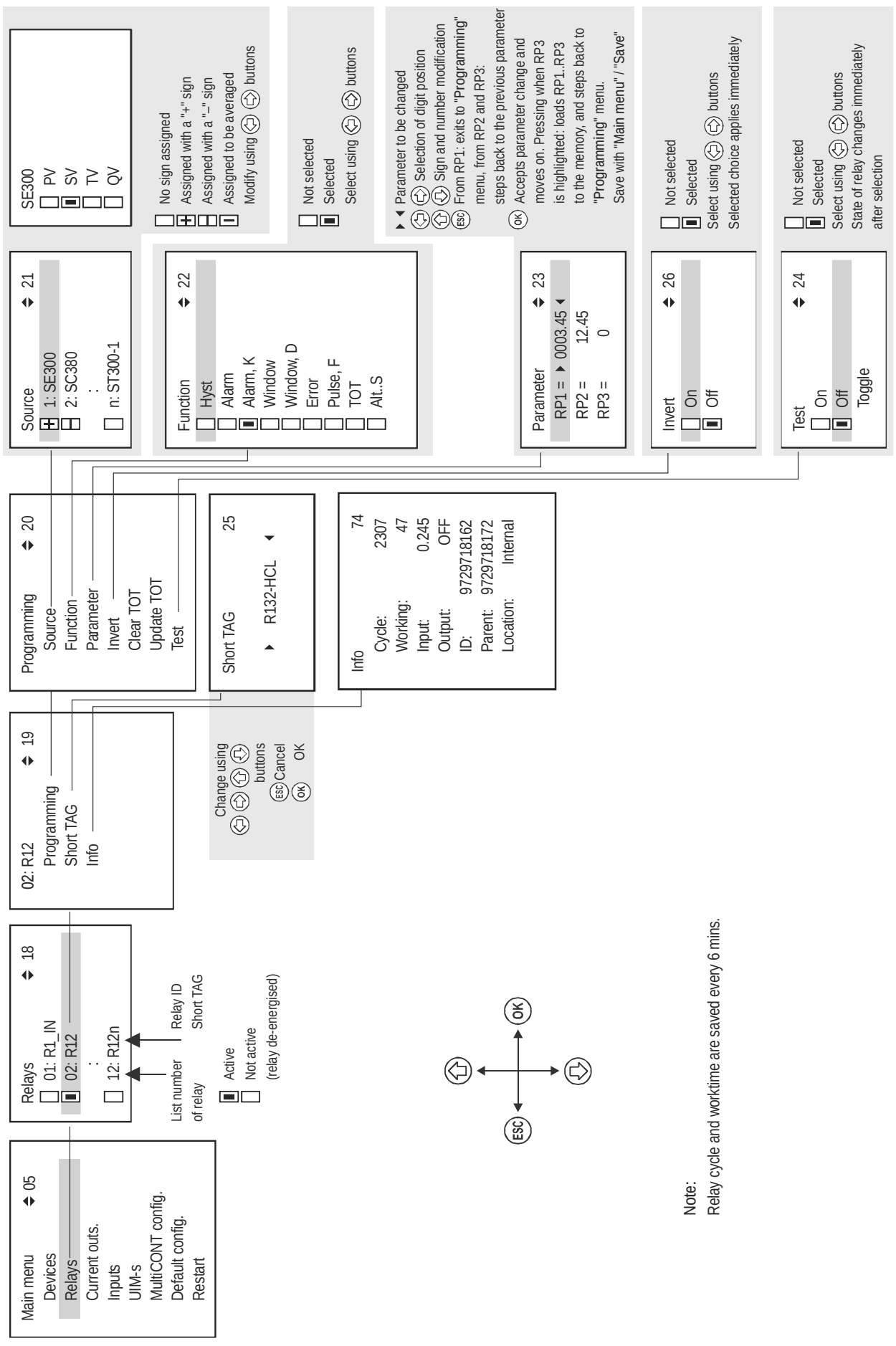
APPENDIX 2. THE MENU SYSTEM OF THE MULTICONT P-100



APPENDIX 2. THE MENU SYSTEM OF THE MULTICONT P-100 (CONT.)

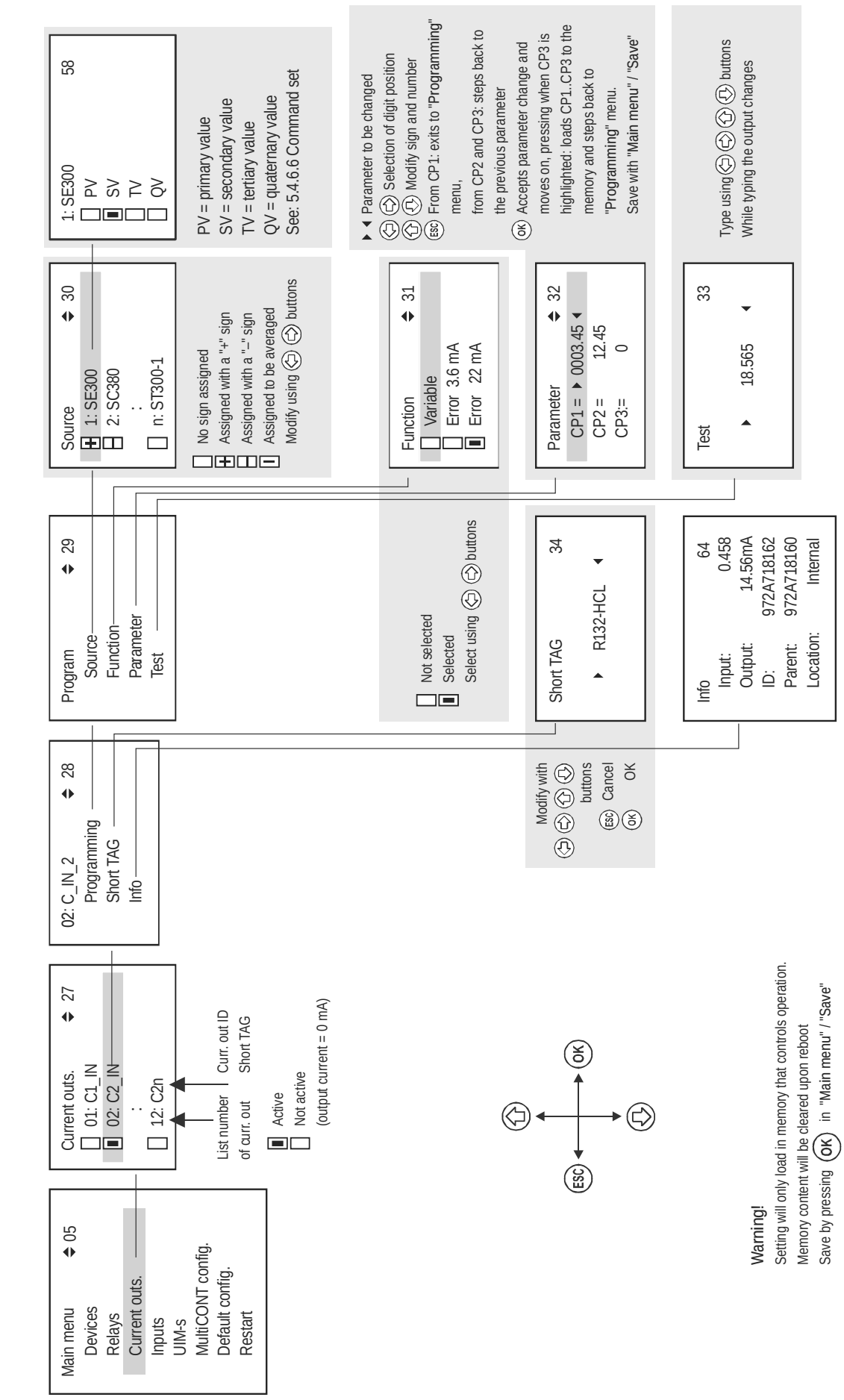


APPENDIX 3. RELAY PROGRAMMING



Note:
Relay cycle and worktime are saved every 6 mins.

APPENDIX 4. CURRENT OUTPUT PROGRAMMING



APPENDIX 5. MEASUREMENT MODE